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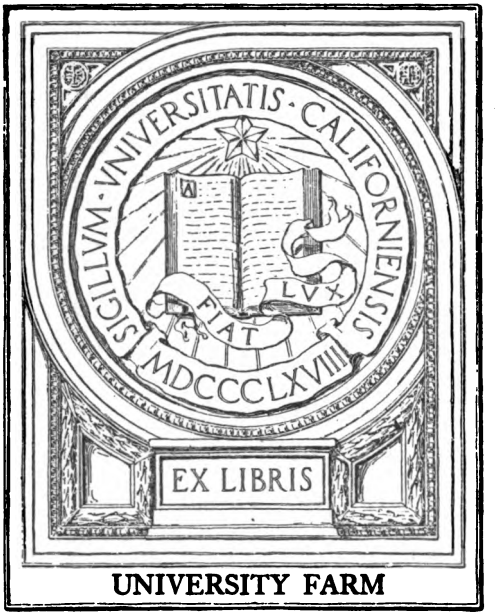

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TRANSACTIONS

OF THE

KANSAS

STATE HORTICULTURAL SOCIETY,

(ORGANIZED IN 1869.)

CONTAINING

THE PROCEEDINGS OF THE FORTY-SIXTH AND FORTY-SEVENTH ANNUAL MEETINGS, TOPEKA, DECEMBER, 1912, AND DECEMBER, 1913, ALSO STATE HORTICULTURAL STATISTICS FOR 1912 AND 1913.

VOL. XXXII.

EDITED BY THE SECRETARY, WALTER WELLHOUSE.

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TOPEKA. 1914.

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LETTER OF TRANSMITTAL.

ROOMS OF THE KANSAS STATE HORTICULTURAL SOCIETY.
STATE CAPITOL, TOPEKA, February 18, 1914.

To Hon. Geo. H. Hodges, Governor:

We have the honor to transmit herewith the thirty-second volume of Transactions of the Kansas State Horticultural Society, containing reports of the forty-sixth and forty-seventh annual meetings, horticultural statistics for the years 1912 and 1913, and such other matters as seem appropriate to promote the horticultural interests of the state.

Very respectfully,

J. T. TREDWAY, *President.*
WALTER WELLHOUSE, *Secretary.*

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B. F. SMITH, *Vice President* ..... Lawrence.
WALTER WELLHOUSE, *Secretary* ..... Topeka.
EDWIN SNYDER, *Treasurer* ..... Topeka.

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PROF. GEO. A. DEAN ..... Manhattan.

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Second District, B. F. PANCOAST ..... **Iola.**
Third District, F. L. KENOYER ..... Independence.
Fourth District, C. C. COOK ..... Eskridge.
Fifth District, ALBERT DICKENS ..... Manhattan.
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Seventh District, E. E. YAGGY ..... Hutchinson.
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EDWIN SNYDER ..... Topeka.

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Burrill, Prof. T. J., Urbana, Ill.
Campbell, W. G., jr., St. Joseph, Mo.
Forbes, Prof. S. A., Champaign, Ill.
Goodman, L. A., Kansas City, Mo.
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Hale, J. H., South Gastonbury, Conn.
Harrison, C. S., York, Neb.
Irvine, J. M., St. Joseph, Mo.
Jordan, Menzo, Champaign, Ill.
Kelsey, Prof. S. T. (the last of the original members), Los Angeles, Cal.
Lantz, Prof. D. E., Washington, D. C.
Waugh, Prof. F. A., Amherst, Mass.

Faculty of Kansas State Agricultural College, Manhattan, Kan., as follows:

The President.
Chair of Chemistry and Mineralogy.
Chair of Botany and Horticulture.
Chair of Zoölogy and Entomology.
Chair of Household Economy and Hygiene.
Chair of Industrial Art and Design.

Also Chair of Entomology of the University of Kansas.

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LIFE MEMBERS RESIDING IN KANSAS.

Alexander, J. J., Norton, Norton.
Barnes, William H., Independence, Montgomery.
Baker, Alvin F., Baldwin, Douglas.
Barrett, S. T., Centralia, Nemaha.
Bauer, M., Wathena, Doniphan.
Beckley, J. C., Springhill, Johnson.
Beebe, Mrs. Elizabeth, Columbus, Cherokee.
Bingham, A. C., Sabetha, Nemaha.
Blackmore, C. A., Sharon, Barber.
Blair, Geo. A., Mulvane, Sumner.
Booth, William, Leavenworth, Leavenworth.
Bourne, D. M., Delphos, Ottawa.
Brazelton, John, jr., Wathena, Doniphan.
Brooke, A. L., Grantville, Jefferson.
Brown, Geo. E., El Dorado, Butler.
Buckman, A. H., Topeka, Shawnee.
Buell, D. G., Hiawatha, Brown.
Bullard, Mrs. C. W., Tonganoxie, Leavenworth.
Bullard, H. S., Tonganoxie, Leavenworth.
Cecil, J. F., Topeka, Shawnee.
Chandler, M. E., Argentine, Wyandotte.
Coburn, F. D., Topeka, Shawnee.
Cook, C. C., Eskridge, Wabaunsee.
Cook, Thos. F., Effingham, Atchison.
Cooley, E. H., Wichita, Sedgwick.
Cone, W. R., Hutchinson, Reno.
Cousins, John, Eskridge, Wabaunsee.
De Baker, D., Topeka, Shawnee.
Dickens, Albert, Manhattan, Riley.
Dickinson, S. S., Larned, Pawnee.
Dixon, F. W., Holton, Jackson.
Entsminger, A. L., Silver Lake, Shawnee.
Fergus, J. B., Kincaid, Allen.
Ferris, H. L., Osage City, Osage.
Frank, A. N., Wathena, Doniphan.
Fulcomer, John, Belleville, Republic.
Geyer, Miss E., Leavenworth, Leavenworth.
Graham, I. D., Topeka, Shawnee.
Gravatt, Henry C., Sabetha, Nemaha.
Graves, J. M., Effingham, Atchison.
Greene, Geo. O., Manhattan, Riley.
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Griesa, T. E., Lawrence, Douglas.
Griesa, W. S., Lawrence, Douglas.
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Harris, E. P., Topeka, Shawnee.
Harshbarger, W. A., Topeka, Shawnee.
Hibarger, J. D., Wichita, Sedgwick.
Holman, E. J., Leavenworth, Leavenworth.
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Holsinger, Geo. W., Rosedale, Wyandotte.
Holsinger, G. L., Rosedale, Wyandotte.
Hoover, E. G., Wichita, Sedgwick.
Huston, N. W., Manhattan, Riley.
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Kern, H. H., Bonner Springs, Wyandotte.
Kline, C. A., Topeka, Shawnee.
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Lawrence, R. E., Wichita, Sedgwick.
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Longstreth, C. H., Lakin, Kearny.
Lux, W. L., Topeka, Shawnee.
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McNicol, James, Lost Springs, Marion.
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Pelham, J. L., Hutchinson, Reno.
Perkins, J. S., Turner, Wyandotte.
Perkins, R. H., Turner, Wyandotte.
Phillips, B. A., Osborne, Osborne.
Porter, H. H., Pittsburg, Crawford.
Remsburg, J. E., Potter, Atchison.
Richardson, G. C., Tonganoxie, Leavenworth.
Ringle, W. E., Cherryvale, Montgomery.
Rose, Geo. E., Rosedale, Wyandotte.
Rude, F. P., Topeka, Shawnee.
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Scott, A. E., Colony, Allen.
Sharpe, James, Council Grove, Morris.
Smith, A. B., Topeka, Shawnee.
Smith, B. F., Lawrence, Douglas.
Smith, W. W., Le Roy, Coffey.
Snyder, Edwin, Topeka, Shawnee.
Sutton, A. H., Independence, Montgomery.
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Taylor, T. T., Hutchinson, Reno.
Thompson, J. A., Edwardsville, Wyandotte.
Tredway, J. T., La Harpe, Allen.
Tuttle, D. D., Vinland, Douglas.
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Vandever, Geo. A., Hutchinson, Reno.
Wakeman, E. V., Wathena, Doniphan.
Wellhouse, Walter, Topeka, Shawnee.
Wellhouse, Walter H., Topeka, Shawnee.
Wheeler, E. D., Wa Keeney, Trego.
Wheeler, J. B., Oskaloosa, Jefferson.
Whiteker, Geo. P., Topeka, Shawnee.
Whitney, O. F., Topeka, Shawnee.
Wickham, F. E., Wichita, Sedgwick.
Williams, J. L., Kansas City, Wyandotte.
Williams, J. W., Holton, Jackson.
Willis, A., Ottawa, Franklin.
Wilson, A. V., Kansas City, Wyandotte.
Yaggy, E. E., Hutchinson, Reno.
Yaw, Frank, Wichita, Sedgwick.

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LIFE MEMBERS NOT RESIDING IN KANSAS.

Barnes, J. T., Hansen, Idaho.
Chandler, C. A., Kansas City, Mo.
Coombs, B. F., Denver, Colo.
Daniels, E. T., Purcell, Okla.
Davidson, C. M., Huntington, W. Va.
Dobbs, J. B., Amherst, S. Dak.
Eames, W. B., Grand Valley, Colo.
Fosnot, W. E., Keosauqua, Iowa.
Holsinger, C. V., Milwaukee, Wis.
Hitchcock, Prof. A. S., Washington, D. C.
Lux, Geo. P., Los Angeles, Cal.
Lux, Phillip, Delano, Cal.
Lyon, E. H., Palisades, Colo.
Milliken, Robert, Nampa, Idaho.
Miller, E. L., Kansas City, Mo.
Moburg, F. O., Omaha, Neb.
Moeser, Wm., Spokane, Wash.
Munger, Geo. M., Los Angeles, Cal.
Rubart, Miss Lizzie, Batavia, Ark.
Stephens, E. F., Crete, Neb.
West, Geo. H., Colorado Springs, Colo.
Van Deman, H. E., Washington, D. C.
Wild, Henry N., Sarcoxie, Mo.
Yaggy, A. F., Hillsdale, Ill.

The following life members have moved from addresses given, and can not be traced:

Abner, Allen, College Park, Cal.
Davis, John H., Denver, Colo.
Gray, E. M., Durant, Okla.
Godfrey, A. N., Dayton, Wash.
Hall, M., Okla.
Harris, F. B., White City.
Johnson, Mrs. Geo. Y., Portland, Ore.
Johnson, Mrs. V. M., Delto, Mo.
Litson, W. H., Wichita, Kan.
Moser, M. R., Wichita.
Newberry, H. J., Enid, Okla.
Parker, Mrs. B. F., Haviland.
Plank, Prof. E. N., Kansas City (honorary).
Roberts, H. B., Perry.
Sheffield, C. H., Topeka.
Shoe, L. A., Highland.
Taylor, E. A., Houston Heights, Texas.
Weidman, J., Oklahoma.

ANNUAL MEMBERS, 1912.

Clark, A. M., Baldwin.
Dean, Prof. G. A., Manhattan.
Doane, J. F., Topeka.
Dyer, R. V., Admire.
Emery, W. T., Wichita.
Hensleigh, M. M., Winchester.
Hershey, N. G., Abilene.
Merrill, J. H., Manhattan.
Noland, P. H., Kansas City, Mo.
Spangler, A. J., Lawrence.
Watkins, W. E., Kansas City, Kan.
Waugh, Randall, St. Louis, Mo.
Webster, Dr. C. S., White City.

ANNUAL MEMBERS, 1913.

Curry, W. R., Dunavant.
Dean, Prof. G. A., Manhattan.
Groh, T. C., Wathena.
Huff, A. S., Sharon.
Hulse, Hiram, Topeka.
Jones, Frank, Lawrence.
Lewis, Prof. D. E., Manhattan.
McCulloch, J. W., Manhattan.
McNown, John, North Topeka.
Merrill, Fred S., Manhattan.
Merrill, J. H., Manhattan.
Shull, Prof. C. A., Lawrence.
Skinner, J. H., North Topeka.

DELEGATES TO THE FORTY-SIXTH ANNUAL MEETING.

Allen County Horticultural Society, E. I. Crowell and J. W. Johnson; alternates, Mrs. E. I. Crowell and S. H. Weith.

Douglas County Horticultural Society, A. H. Griesa and C. W. Murphy.

Shawnee County Horticultural Society, Mrs. B. B. Smyth and Mrs. Edwin Snyder; alternates, N. I. Dalton and Myron Gilmore.

Wabaunsee County Horticultural Society, Mrs. L. A. Cousins and C. W. Page.

Wyandotte County Horticultural Society, M. E. Chandler and H. F. Wulf; alternates, W. T. Hovey and Geo. Holsinger.

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DELEGATES TO THE FORTY-SEVENTH ANNUAL MEETING.

Allen County Horticultural Society, G. M. Johnson and J. W. Johnson.
Douglas County Horticultural Society, A. H. Griesa.
Sedgwick County Horticultural Society, T. C. Garst.
Wabaunsee County Horticultural Society, J. B. Myers and Wm. M. Rinehart.
Wyandotte County Horticultural Society, M. E. Chandler and Gerald Holsinger.

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PROCEEDINGS

OF THE FORTY-SIXTH ANNUAL MEETING OF THE KANSAS STATE HORTICULTURAL SOCIETY, HELD AT TOPEKA, DECEMBER 18, 19 AND 20, 1912.

FIRST DAY—Afternoon Session.

The forty-sixth annual meeting of the Kansas State Horticultural Society was called to order at 1:30 P. M. by President Hoover, in Representative Hall, Topeka, Kan., on Wednesday, December 18, 1912.

PRESIDENT HOOVER: As the Rev. Roy Guild is not present, we will be led in prayer by Mr. Jas. A. Staples.

PRESIDENT HOOVER: We will now have the annual reports of trustees by congressional districts on conditions and progress. First district, W. R. Martin, of Wathena.

REPORT FROM THE FIRST DISTRICT.

By W. R. MARTIN, Trustee, Wathena.

I beg to submit the following report. Fifty blanks were mailed to the same number of horticulturists in the district, and twenty-one were properly filled and returned, all of which indicate the fruit buds were in excellent condition in the spring of 1912, except peaches. The fruit buds of the peaches were killed by cold weather during the winter.

I feel safe in saying that the year 1912 has been the banner fruit year for the first district. Sorry that I can not furnish you a more complete report of all the fruit marketed in the different counties, but it seems a very difficult matter to secure this important information, as people are slow to appreciate the value of the same. I will therefore ask you to kindly accept such information as was in my power to secure.

Atchison county reports: Apples, 75 per cent; pears, cherries and other fruit about 50 per cent.

Brown county reports: Apples, 75 per cent; all other fruit about 50 per cent.

Jackson county: Apples, 80 per cent; berries, 50 per cent; grapes, 90 per cent.

Jefferson county: Apples, 90 per cent; small fruit, 40 to 75 per cent.

Leavenworth county: Apples, 80 per cent; pears, 75 per cent; small fruit, 40 to 50 per cent.

Nemaha county: Apples, 20 per cent; cherries, 80 per cent; no small fruit to speak of.

Shawnee county: Apples, 75 per cent; pears, 50 per cent; cherries, 75 to 80 per cent.

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Doniphan county has harvested its banner fruit crop this season. We have marketed 1270 cars of apples, valued at $508,000. Of small fruits we have marketed the following amounts: Strawberries, 80,000 cases; average selling price, $1.32 per case—$105,600. Raspberries, 35,500 cases; average selling price, $2.38—$84,490. Blackberries, 38,200 cases; average selling price, $1.91—$72,962. Grapes, 184,000 baskets, which were sold at an average price of 17 cents per basket—$31,280.

In addition to this we have sold cherries, plums, currants, gooseberries, etc., to the amount of $5000, which will bring the total sales of Doniphan county fruit up to $807,332.

As our Professor Merrill has a paper on spraying, we will not attempt to say anything along this line.

REPORT FROM THE SECOND DISTRICT.

By M. E. CHANDLER, Trustee, Argentine.

Of all the crop reports sent out only fourteen were returned, but they gave a very encouraging report as compared with the reports of a year ago.

In our own county, Wyandotte, we had a large crop of all fruits, with the exception of peaches which were killed in the bud during the winter of 1911-'12. Strawberries in our immediate locality were very heavy, but about the middle of the picking season a bad hail storm damaged a great deal of the fruit. Greenhouses south of us lost 75 to 90 per cent of their glass. All fruit in the southern part of Wyandotte county was damaged more or less, while the northern part of the county received no damage.

Strawberries did not net a very large profit, due to the large quantity of berries shipped from the south. Cherries were a good crop with a fair margin of profit, selling from $1.40 to $2.25 per crate. Raspberries were a good crop, ranging in price from $2.75 to $4 per create, but the acreage is very small compared with a few years ago. Blackberries were a very good crop, prices ranging from $1.25 to $2 per crate. Plums, good crop with very little demand. Pears were a very heavy crop, demand not very brisk, due to the quality of the fruit and not the supply. There are entirely too many Kieffer pears planted. Grapes, a heavy crop with a great demand and prices good. Apples, very large crop, in fact the largest we have had for several years. Where they were sprayed, the quality was nearly all number one and were sold on track or put in storage.

Taken as a whole the second district had a very good fruit crop with prices ranging fairly good, and the fruit growers should feel encouraged enough to continue planting and to take care of what they do plant, to cultivate, prune and spray. The secret of growing good fruit is to get the best varieties, to cultivate, prune and spray at the proper time.

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REPORT FROM THE THIRD DISTRICT.

By F. L. KENOYER, Trustee, Independence.

The southwest corner of the state does not have many fruit specialists, consequently there are few commercial orchards.

The past season has been exceptionally good for the tree fruits throughout the district where the spray pump was used. Since not one man in ten sprays his fruit trees, the apple crop was almost an entire failure on account of the cankerworm and the unprecedented invasion of the forest tent caterpillar. This latter insect has its natural habitat in the jack oak forests. During the last few years they have increased so rapidly that there are no longer forests enough to contain them, so they have gone to the orchards and shade trees for their food supply. In many instances the worms were hatched out on the apple and plum trees, where the eggs had been deposited the previous fall; in other cases the worms marched in great droves from the defoliated forests and orchards to other trees and orchards, which they soon stripped of all their leaves. These forest caterpillars did the greatest damage to apples and plums. The other fruits were but little injured by them. After this insect went into the chrysalis state over 99 per cent of them were destroyed by a small parasitic wasp which pierced the cocoon with its ovipositor and deposited its eggs within the chrysalis. In a few days a small white grub hatched from the egg and fed upon the chrysalis. It is pretty certain that the forest caterpillar will not trouble us again for several years, but the cankerworm is still with us. On account of these two insects the apple and plum crop was reduced from what would have been a full crop to one so small that there was scarcely any home-grown fruit in the market.

The pear crop was above the average in quantity and quality. The cherry crop was by far the heaviest I have ever seen in our locality. The price received in the home markets was $2 to $2.50 a crate, which is $1 lower than the year before. Peaches were about three-fourths of a full crop. They were somewhat injured by the drouth, as were all the peaches shipped in from the south.

Grapes were abundant although many of the vines are in poor condition from the attack of the phylloxera. Few of the varieties containing Labrusca blood escaped injury from this insect. The Campbell's Early, Beacon and Brilliant were practically killed, and even the resistant Concord was injured. I will name the varieties that were injured in my vineyard in the order of their injury: Campbell, Brilliant, Beacon, Moore, Triumph, Dracut Amber, Wapaunecka, Concord, Headlight, Martha, and perhaps a few others. The wholly immune varieties are Dr. Collier, Fern, Muench, Mericadel, Bell, R. W. Munson, Cloeta, Banner, and Eclipse. I shall use Dr. Collier and Fern as stock upon which to graft the Campbell, Moore and Brilliant and in this way prevent further injury to these valuable varieties.

The strawberry crop was badly injured by the sudden drop in temperature on November 11, 1911. On that day at noon the temperature stood at 83 degrees. In one hour it had dropped 50 degrees and was down to 12 degrees at sunrise the next morning. This sudden change killed many

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varieties of plants and the buds of most varieties except the Dunlap. Fortunately there are more Dunlaps grown than all other varieties together, so we had about a half crop of strawberries.

Throughout the district the raspberry and blackberry crop was almost a complete failure on account of the drouth of 1911, which made it difficult to grow the plants. The past season has also been exceedingly poor for plant growth, and the outlook for all kinds of small fruits is not very flattering. The acreage is smaller than usual and the stand of plants poor.

REPORT FROM THE FOURTH DISTRICT.

By C. C. Cook, Trustee, Eskridge.

Of the fifty blanks sent out only ten were returned, two of which were blank. Coffey county sent two reports, stating that the bloom was good, other than peaches, which were killed in the bud, except seedlings. Apples, 25 per cent; pears, 100 per cent; peaches, none to 20 per cent; plums, 15 per cent; cherries, 70 per cent; blackberries, none to 50 per cent; raspberries, none to 100 per cent; strawberries, none to a fair crop; grapes, good crop; gooseberries, a good crop.

Apples recommended: Summer—Early Harvest, Red June, Maiden Blush, Grimes Golden, Jeffries. Winter—Winesap, Jonathan, Ben Davis, Jeniton. Peaches of all kinds. Pears—Kieffer, Garber, Duchess, Seckel, Sudduth, Bartlett. Plums—Gold, Burbank, Wild Goose, Marianna. Grapes—Concord, Ives, Moore's Early.

Cankerworms were sufficient to kill seven-eighths of the apple crop. Not much spraying, but considered successful where properly done. No planting. More interest taken in horticulture. Condition of trees fair. No planting of forest trees. We protect native insect-eating birds, and they are about holding their own. No damage to fruit by birds reported. Last frost of spring, April 10; first frost of fall, September 28.

There were three reports from Woodson county, but not so thorough in detail as those from Coffey county, although much the same as far as they went. They are in favor of a closed season on the quail for three years. There was an average crop of fruits of all kinds. Cankerworms were very destructive, so much so that they killed many apples and plums.

Report from Lost Springs, Marion county, gives the general condition of trees as good. About 50 per cent of fruit matured. No small fruit.

Report from Greenwood county gave condition of fruit buds as good. Half crop of fruit set. Matured crop picked averaged from 10 to 25 per cent. No small fruit. They have the standard varieties of fruit. Blight and the various insects abound. They have the native birds, which they try to protect.

A report from Morris county showed an abundance of bloom and a good set of fruit. They picked 75 per cent of a crop of apples, 100 per cent of pears, 100 per cent of cherries, 25 per cent of plums, 100 per cent of grapes. There were no insects or blight in this orchard, as it had been thoroughly sprayed, but they were prevalent in other orchards not sprayed. No planting of fruit or forest trees reported. The native birds nest with us, which we try to protect.

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We had, in Wabaunsee county, a good bloom of all fruits except budded peaches and blackberries. The peaches were killed in the bud, but we are not certain of the cause, whether it was the drouth and hot weather of the fall of 1911, the cold weather of January, 1912, or the excessive snow, which amounted to forty-two inches at Eskridge. Blackberries were killed root and branch by the drouth of 1911. Several varieties of apples set no fruit. Jonathan and Winesap set a full crop. Ben Davis, Jeniton and York Imperial set 20 per cent of a crop. There were no peaches except seedlings. Pears and plums were 10 per cent of a crop. Cherries were a full crop. There was very little of the small fruits. Of the apple crop there were about 1000 bushels shipped out, at 40 cents per bushel. Thousands of bushels were made into cider, and many decayed in the orchards. I think it would be profitable to carefully pick apples at the proper time and store them in cellars or pits and let them remain until they could be sold for use.

Fruit trees on the clay or gumbo of our uplands are a failure unless the orchard is well drained. If the trees are well fertilized and pruned you may succeed in raising some fruit, but I do not think it will pay to plant a commercial orchard on such upland. One of my neighbors, who contemplates planting an orchard next spring, has treated his ground with dynamite, so that in time we can see the result of this method. I fear the subsoil will close up the first time it is thoroughly wet. The heavy subsoil here on our uplands is the worst enemy there is to the fruit.

J. L. WILLIAMS: I want a little bit of explanation about that dynamite.

C. C. COOK: He had a prospective orchard, and he went through and staked it off, then dug holes and exploded charges of dynamite in the locality where he expected to put his trees, and is going to plant there in the spring.

J. L. WILLIAMS: The reason I asked for further explanation was this: Down in our county there are several parties who did have orchards and dynamited the trees clear out of the ground. I did n't know whether he meant that or to plant them.

N. I. DALTON: Don't you think that was a wise proposition, where they blew them clear out of the ground?

J. L. WILLIAMS: I think under the circumstances, and with those men handling the orchards, it was a good thing they blew them out of the ground. On land within a half mile of where all that work was done, I have some apple trees 43 years old, and there is only about one where there ought to be ten, they are so old, but I got 2865 bushels of good apples this year off of about ten acres, and they will bring $150 an acre this year even if the trees are old. This other fellow did n't take any care of his, and I think the man that blew them out of the ground did well, because he was not a success as an orchardist.

DR. BOHRER: This matter of dynamiting the ground, blowing out holes for trees, I think an excellent plan in many parts of the state where there is a heavy layer of clay below the soil, and I think it would be

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well for all persons who contemplate putting out timber of any kind to dynamite the whole line; but as Prof. Dickens remarked here a while ago in conversation, there is one thing should be borne in mind. I never tried the experiment, but he states in some parts where they dynamite, three or four feet under the ground there will be a cavity left. You want to go to work and open that up and pack the dirt down. I don't mean to tamp it, but just put the dirt back there. All over the western part of Kansas that has to be done.

REPORT FROM THE FIFTH DISTRICT.

By ALBERT DICKENS, Trustee, Manhattan.

The season was favorable as usual to the good grower. The man who had had his orchard fairly well cared for in 1911 was able to withstand the dry weather of 1912. Orchards that were not well cared for in 1911 suffered worse in 1912 than in 1911. Our soil workers told us last spring that we had less moisture in the spring than we had the year before, and that condition was constant until quite late in the season. We had too many apples for the weather conditions in a large majority of orchards in the fifth district. Orchards that had been well cultivated and fairly well pruned had a much larger proportion of marketable apples than those which were not well cultivated and well cared for. I will not take your time to read the data concerning reports from the different counties. I think they vary from 100 per cent of a crop of mature apples down to 25 per cent in Marshall county. The averages of the fruits for the entire district from the reports of the counties was 50.3 per cent apples, 73 per cent pears, 69 per cent peaches, 78 per cent plums, 54 per cent cherries, 37.5 blackberries, 56 per cent raspberries, 61 per cent strawberries, 61 per cent gooseberries, and 70 per cent of a crop of grapes. In the discussion invited on that report blank sent out, as to the particular cause of grief this year, 12 found more trouble in getting pickers, and marketing, than anything else. There was n't a man who had the nerve to say he doubted the efficiency of spraying. Every man said he was sure it paid if well done.

Interest in pruning was reported to be much more general than in previous years, that more pruning had been done, and that orchards were for the most part in better condition. A number of old orchards had been grubbed out and the ground used for other purposes, but they were almost unanimous that the orchards were in better condition, as far as care was concerned, than in former years.

The matter of marketing and finding the consumers is the matter uppermost in the mind of practically every one of those who raised apples this year.

The question as to whether more orchards were being set out was answered in the affirmative more times this year than any time in five years. The majority of them reported that more trees would be set out next year than previous years; not in a large way, but nearer the towns a number of men awoke to the proposition that they were losing something in not having apples to supply the home market.

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One of the things we have been investigating is the matter of common storage of low-grade apples. For instance, this year we all know there was a surplus of apples early. One of our growers said he would give ten dollars if any man would tell him where he could dump a load of apples. A month later the market was considerably better, enough so to pay to put them in and take them out of some common storage. At the College we have had good results this year and last year in keeping apples in a concrete cave. I doubt yet whether it is well to compete with cold storage in marketing first-class apples, but with No. 2 apples it is a question of getting picking, crating and pruning out of it. A man at Abilene and a man farther up the line that put up 500 or 600 bushels of apples—good apples—found a market for them in the holiday season.

This year we are having rather better results with York Imperials. I mean most any of the growers around Manhattan that I happen to be acquainted with. There has been a good deal of complaint with the storage of Yorks in former years, and last year and this year Yorks in any common storage showed up litle loss, practically no deterioration and no scald whatever, and it is my belief—it is more than a belief, I am sure it is a fact—that a large proportion of the growers of Kansas are overlooking giving the matter of common storage for their low-grade apples proper consideration. It is a good deal better to have your apples where you can handle them than it is to pay storage on second or third grade and wonder what you are going to get for them.

A great many inquiries have come to the College this year in regard to better associations for marketing. Whether or not the time is here for an association of horticultural men, I can not say. But the more you know about what your neighbor has, the better you are off. The old days of any jealousy or envy among growers ought to be past, or is going by, not because of any particular improvement in human nature but because they find it don't pay. For instance, there is no excuse why seven or eight carloads of apples should be piled up in any one week in a little town of 200 or 300 inhabitants, as occurred in the little town of Zurich this year. There was a shortage of apples there, and three or four men heard of it and shipped. Now, then, with any one finding out in this state where apples are going it would have saved some man some expense and some grief and some trouble if he had known just how many men had their eyes on Zurich. The question of horticulture, of course, is to get the man who eats hooked up right close with the man who produces, and this is worthy of the best thought of this society and their able assemblage of men.

REPORT FROM THE SIXTH DISTRICT.

By J. J. ALEXANDER, Trustee, Norton.

The year 1912 came in with very fair prospects. The fruit buds were very good, but the winter was cold and severe, and trees had suffered so much from dry weather for four years that we had very heavy losses in our orchards, especially the peach. We lost at least 75 per cent of the peach trees in the northwest part of the sixth district. What trees were left came out in the spring in fine shape, bloomed fine, and made a good crop considering the weakened condition of the trees. Bloom was 100 per cent.

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Apples matured from 15 to 100 per cent, but were very wormy and not of a very high grade.

There was but very little spraying done in our district last spring and summer, and the result was that we had a very small per cent of matured salable apples.

Summer apples: Duchess of Oldenburg, Early Harvest, Maiden Blush, and Whitney Number Twenty.

Winter apples: Ben Davis, Missouri Pippin, Grimes Golden, Jeniton; in fact, there was but very little difference in the varieties in bearing. We got about 50 to 75 per cent of apples all over the district.

Among the pears the Kieffers were the best we had, about 50 per cent. The Duchess did well, but did not bear as well as the Kieffer. Pear trees blight very badly in this part of the state.

Peaches that were left alive all bore a good crop. I could not tell any difference in the varieties. The budded peaches were very fine and the seedling trees were very full of fruit, but it was of very poor quality, but none were allowed to go to waste. The trees are in better condition this fall than they have been for five years, and have made a good growth and have gone into winter well matured and in fine shape.

Plums of all varieties bore well. The Elwood is still in the lead in this part of the state; in fact, they bore too heavy for the good of the trees. The New American has been a great success with me. All varieties bore very well and were clear of curculio stings. The reports give at least 75 per cent of plums all over the sixth district.

Cherries were not as good as usual in this part of the state. This seems to have been an off year for cherries. The Early Richmond and Montmorency proved to be the best in yield. The reports show from 10 to 75 per cent of a crop over the district.

Blackberries: None reported; they do not do any good in this part of the state.

Apricots were a good crop all over the district, the first and only crop in five years, and they were of a fine quality.

Raspberries: The blackcaps do better, but the best report I received was 10 per cent of a crop.

Strawberries do fairly well in this part of the state, but must have plenty of water during bearing season.

Gooseberries made a good crop this season. The Houghton and Downing are the best for this locality. The reports from over the district give from 25 to 100 per cent of a crop.

There are few varieties of grapes that do well in this part of the state. The Concord and its class do fairly well. Reports give from 10 to 50 per cent of grapes in the sixth district.

We have blight on apple and pear and some apple blotch. There is but little spraying done in northwest Kansas. The orchards are very small and the owners do not take the time to spray, and if they did they do not seem to know what to spray for, nor when to spray. People as a general thing take very little care of their trees after they have once set the orchard.

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Trees were not planted to any great extent last spring because of the four bad years of drouth, and freezes, which were very hard on all fruit and shade trees. The people out in this part of the state have been and are yet very greatly discouraged over the heavy losses of crops, of trees, of horses, and now of cattle; but despite all these failures and losses of the crops of grain, feed and fruit, the people are feeling more encouraged to get up and go on, as has ever been the motto of western Kansas farmers.

Birds were not very troublesome this year among the fruits, except the blue jay. That naughty little fellow worked on the cherries very badly; in some localities it was nip and tuck to see who would get the most cherries, and Mr. Blue Jay generally came out ahead.

The latest frost in the spring came about May 5, and the first this fall was September 20.

I am hoping to be able to give a more favorable report in the year 1913.

My Dear Mr. Wellhouse: This picture was taken June 16, 1913. The product was 70 bushels of exceedingly fine cherries on less than two-fifths of an acre of flat, sandy loam; crop picked and all marketed at the farm. Gross receipts at $2.50 per bushel, $175. Ground kept in clean cultivation every year. No irrigation used. Rainfall very light. Varieties, May and Early Richmond.

What we have done, thousands of others, with intelligent purpose, can do also. Very cordially yours, E. BARTHOLOMEW.

REPORT FROM THE SEVENTH DISTRICT.

By C. A. BLACKMORE, Trustee, Sharon.

One year ago we were called pessimistic, presumably because we told the truth, and some thought our report should be rejected. We come to you this year with quite a different report. Shall we be called optimistic? This has been a very busy year for the horticulturist trying to save his bountiful crop.

We had a fair crop of cherries, blackberries, dewberries, raspberries, currants and gooseberries; a heavy crop of plums, apricots and peaches, and a fair crop of pears and apples. The writer of this report has not had as busy a season as the one just past for several years.

Cherries sold at 40 cents per gallon; blackberries, 15 cents per quart; plums, Wild Goose, one dollar per bushel. All varieties of Japan plums for $1.50 per bushel; apricots, $1.50 per bushel; peaches, early varieties from $1 to $1.50 per bushel—an average of $1 per bushel for the entire season, which began June 20 and closed October 27.

In my own orchard, with the help of one man, we gathered and sold from $25 to $100 worth of fruit per day. Some varieties of peaches made $500 per acre. In answer to many inquiries as to how much my peach crop made the reply has invariably been "a plenty."

Great quantities of fruit trees have been set this fall, and some big plantings have been talked of. A great many trees have died in the past two years because of dry seasons and neglect. Many orchards are entirely gone. Orchards that have been properly cared for have paid

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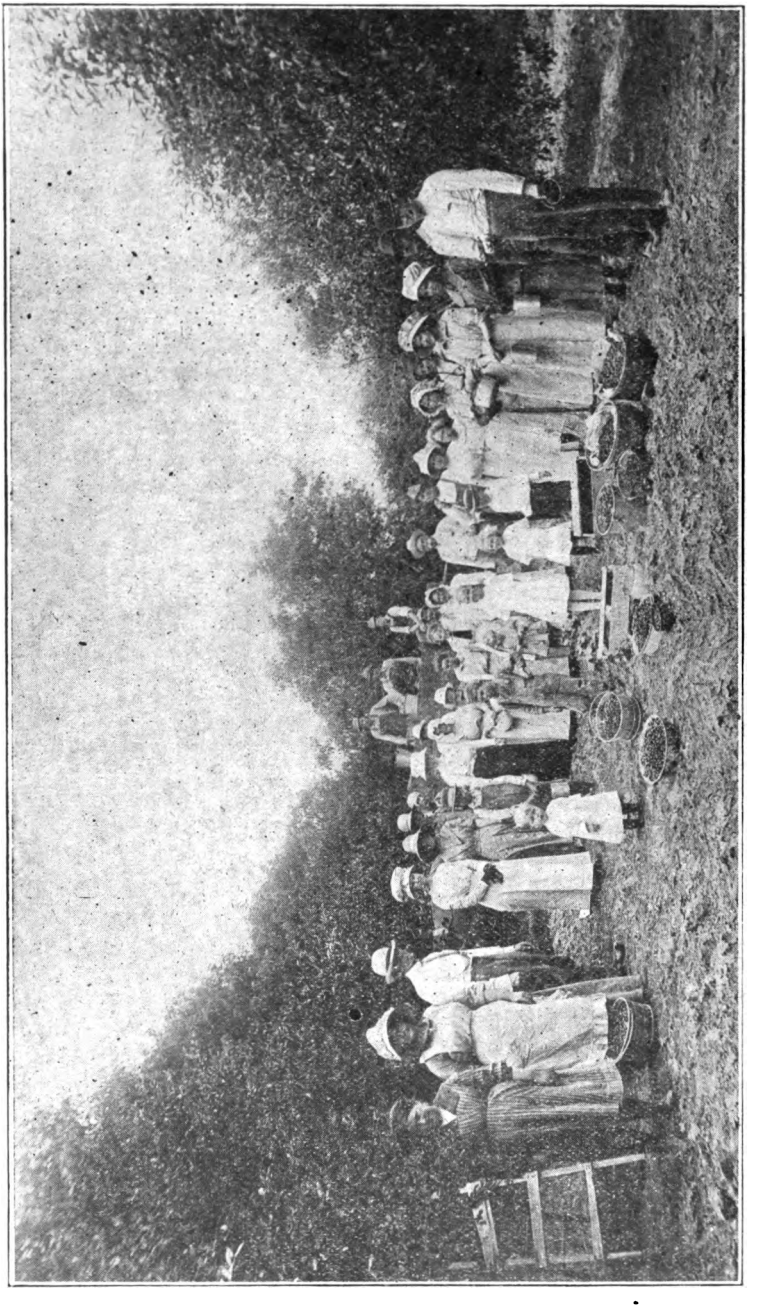

IN THE ORCHARD OF E. BARTHOLOMEW, STOCKTON, KAN.

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well this year. The man that does not take proper care of his orchard will soon be out of the fruit business. It is absolutely necessary that all varieties of fruit trees should be sprayed at the proper time and with the proper material for the different kinds of diseases and insect pests.

The general condition of fruit buds in January, 1912 was good, and produced a full crop of bloom, and set a full crop of fruit. Apples matured from 10 to 75 per cent of a crop; peaches, from 50 to 100 per cent; pears, 50 to 100 per cent; plums, 75 to 100 per cent; cherries, 50 per cent, and grapes, 50 per cent.

The varieties of fruit doing best are: Apples: Yellow Transparent, Maiden Blush, Mammoth Black Twig, Winesap, Rome Beauty, York Imperial and Ben Davis. Peaches: Carmen, Greensboro, Champion, Crawford, Mammoth Health, Henrietta and Elberta. Pears: Duchess, Kieffer and Garber. Plums: Wild Goose, Abundance, Burbank and Gold; the Elwood seems promising. Cherries: Early Richmond, Montmorency and English Morello. Grapes: Campbell's Early, Agawam, Brighton, Moore's Diamond, Ives, Niagara, Concord and Hicks.

The Hicks ripens about with the Concord and resembles it in both fruit and vine, but is of better quality, and an immense bearer. It hung on the vine this season in best condition until frost, and then had to be cut off, as the stems were so tough the bunches could not be pulled.

The insects we have to contend with are the codling moth and some cankerworms. Blotch damaged 75 per cent of the apple crop where not sprayed. Only a few spray, but where practiced it is very successful. Fruit trees and vines are being planted in some sections more than usual, but from a lack of knowledge of how to grow them by the planters, many will never bear fruit. Trees and vines are going into the winter in the best of condition. Forest trees are being planted in many sections and will add greatly to the value of this western country by supplying wood and posts. They will also be valuable as windbreaks.

Birds are not increasing as they should because of so many cats roaming all over the land destroying the birds and quail.

The last killing frost was on April 16, and the first about September 25, 1912.

REPORT FROM THE EIGHTH DISTRICT.

By Geo. A. Blair, Trustee, Mulvane.

The condition of fruit buds in January, 1912, throughout the district, was generally reported good. Some sections showed the effect of the 1911 drouth. The spring conditions were good, and in some localities, owing to the favorable season, were better than in January.

A full crop of bloom followed, of which 80 per cent set fruit, furnishing a harvest of 64 per cent of a full crop. Some sections were damaged by hail. Near Argonia, Sumner county, so great was the destruction that only 5 per cent of a full crop of apples was picked.

Sedgwick county reports show a harvest of 72 per cent of a full crop of apples, 98 per cent of pears, 80 per cent of peaches, 80 per cent of plums, 45 per cent of cherries, 75 per cent of blackberries, 100 per cent of raspberries, 55 per cent of strawberries, and 63 per cent of grapes.

Sumner county gathered 61 per cent of a full crop of apples, 85 per

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cent of pears, 87 per cent of peaches, 90 per cent of plums, 60 per cent of cherries, 50 per cent of raspberries, 20 per cent of strawberries, 50 per cent of gooseberries, and 60 per cent of grapes.

Butler county picked 54 per cent of a full crop of apples, 100 per cent of pears, 75 per cent of peaches, 50 per cent of plums, 33 per cent of cherries, 100 per cent of gooseberries, and 20 per cent of grapes.

One report was received from Harvey county stating that hail destroyed all of the fruit.

Varieties of summer apples doing best in the eighth district are the Early Harvest, Red June, Duchess of Oldenburg, Maiden Blush, Cooper's Early White, and Yellow Transparent.

Winter varieties named are Winesap, Stayman Winesap, Mammoth Black Twig, Ben Davis, Gano, Missouri Pippin, Rome Beauty, Grime's Golden, Jonathan, King David, York Imperial, Jeniton, and Delicious.

Peaches mentioned are Elberta, Champion, Crosby, Triumph, Japan Dwarf Blood, and Fitzgerald.

Pears are the Kieffer, Garber, Duchess, Seckel, Louise Bonne de' Jersey, and one gentleman reports success with the Bartlett.

The favorite plums are Burbank, Abundance, Wild Goose, Shiro, Gold, and Damson.

Cherries are Early Richmond, English Morello, and Montmorency.

Grapes, the Concord, Worden, Niagara, Campbell's Early, Moore's Diamond, Brighton, and Cynthiana are preferred.

Harvey county reports scab and blotch on apples. Butler county says vast amount of blotch killed one-third of the trees.

Sumner county reports all kinds of rot, blight and fungous infection; that the Missouri Pippin and the Ben Davis trees were seriously damaged by blotch, and that the fruit on unsprayed trees was a loss.

Sedgwick county report says unsprayed trees were very badly infected.

Sedgwick county tells of cankerworms stripping her unsprayed orchards, codling moth larvæ tunneling her big red apples and luscious pears, curculio polluting her delicious plums, and San José scale infesting and in some places destroying her beautiful trees.

Sumner county reports the codling moths worse than they have been for years, and that in unsprayed orchards they damaged 80 per cent of the fruit. Cankerworms browsed off the young leaves and tender buds. One reporter says they did all the damage they could, as they took everything in sight.

Butler county states that the measuring worm cut the leaves from all the trees in one section. In sprayed orchards they were held well in check.

Codling moth and cankerworm infested unsprayed orchards in Harvey county.

Spraying is practiced more each year, and when thoroughly done is considered a success. Very few fruit trees are being planted.

Interest in horticulture is on the increase in Sedgwick and Sumner counties.

Fruit trees, vines and bushes are entering the winter in fine condition. A few forest trees were planted in the past year.

The reported damage done to fruit by birds is very slight. Most of it

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is charged to the jay and oriole. A few orchardists protect our insectivorous birds. All reports show them decreasing, with but one exception, which is here appended.

Bird report, by RICHARD H. SULLIVAN.

"The insect-eating birds that nest with us are very numerous. The species that will be given will be grouped in semicolons in order of their relative abundance. Thrashers, mocking birds, robins, catbirds, wood thrushes, bluebirds; cardinal grosbeaks, blue grosbeaks, black-headed grosbeaks; martins; barn swallows; cliff swallows; swifts; wrens; several kinds of vireos; flickers, red-headed woodpeckers, downy woodpeckers; chickadees; goldfinches, chewinks or towhees; kingbirds, wood pewees, phœbes, great-crested flycatchers, scissors-tail flycatchers, Arkansas kingbirds; lark sparrows, field sparrows, song sparrows; nighthawks; kildeers, spotted sandpipers; white-rumped shrikes; western and eastern meadow larks; dickcissels; Baltimore and orchard orioles; jays; cowbirds (through other birds), redwings, grackles; crows; doves; indigo buntings; quail.

"About normal in number, with following exceptions: Robins, while still numerous, were markedly less than during former seasons, except in a few favored localities. Doves do not appear to have been so plentiful, although still numerous. Kildeers were certainly not so numerous during the past season. Mocking birds, somewhat less than usual; on December 1, this year, a lone mocking bird was still to be seen at Hillside cemetery, Wichita. Blue birds are slowly increasing, but very wild. Blue and black-headed grosbeaks and chewinks (or towhees) are met with a little more frequently, though still scarce. Indigo buntings show quite an increase. The Arkansas kingbirds, one of the commonest kinds in Colorado, can be seen here and there, where several years previously they were very scarce. Dickcissels have greatly increased during the past several years, the increase being particularly noticeable in 1912. I knew of six different nesting sites within a few blocks of my home in Fairmount, and have several pictures of nests. Last season they could be seen or heard everywhere near any open field. The scissors-tail flycatcher is slowly increasing. The orchard oriole has materially increased during the past several years."

The last killing frost of spring, 1912, was April 18, and the first killing frost of fall, 1912, was October 22.

Summary: January report of condition of buds was 100 per cent, spring condition 100 per cent, bloom was 100 per cent, fruit set 80 per cent, the harvest gathered was 64 per cent. Cankerworm, codling moth, blotch and other infection, was largely the cause. All summed up it appears to me to be imperfect spraying.

PRESIDENT HOOVER: Any questions you want to ask Mr. Blair? There are some points that might be brought out that would do good.

A MEMBER: I would like to ask the gentleman if he believes in protecting the crow.

G. A. BLAIR: I don't give the crow any special protection. I don't molest him unless he begins to ravage the melon patch, picking melons before I want them picked, molesting hogs, or something of that kind,

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then I get one or two of them and hang them up on a limb in the vicinity, and that settles the question. There is no doubt but that he is a great marauder, yet he does good in a way we don't give him credit for. Now, whether the good he does will overbalance the ill he does I don't know, but I know this fact: The crow is one of the balances nature has in keeping down insect pests. He lives largely on insects.

A MEMBER: What is the hardiest pear?

G. A. BLAIR: I believe the Garber and Kieffer are the hardiest, but it appears that on my place the Duchess has done well.

J. J. ALEXANDER: I would like to ask the gentleman if there is very much difference between the Garber and Kieffer pears. They look very much alike. I have about twenty-five or thirty trees on my place, but they are not bearing fruit yet. They look just like the Garber. I can't tell one from another.

G. A. BLAIR: The difference in the growth of the two trees is marked, at least in my orchard. The Keiffer has more upright growth, while the Garber has a broader growth. Now, in regard to the fruit. There is n't much neck to a Garber pear. It is oblong, but there is not much pear shape to it. As to fruit quality, if ripened carefully I would prefer the Kieffer.

J. J. ALEXANDER: I asked that question because I saw quite a number of barrels of pears—probably twenty barrels—unloaded from a commission house in Topeka. Some of them were marked Kieffer and some of them Garber, and I could n't tell any difference except by the name on the head of the barrel.

A MEMBER: Perhaps those pears were like some apples I saw in town the other day. Some of them were marked Missouri Red Streak and some of them marked Ben Davis, and I could n't tell and difference, because there was n't any.

A MEMBER: Mr. Blair, you spoke of the measuring worm. Is that the cankerworm.

G. A. BLAIR: One of my boyhood recollections was that they were called cankerworm, and this reporter did n't know the difference, evidently, so he called them measuring worms.

DOCTOR BOHRER: Do you think putting a rag or card around a tree sufficient to keep the beetle from which the worm is hatched from going up the tree. I understand it to be a fact that they climb the tree and do not fly up, and if a tarred rag is put around the tree they will stop.

J. J. ALEXANDER: I will say for the doctor's benefit that I tried this on some trees in our park one year when we had the cankerworm. I think most of the beetles were killed, but not by putting a tarred string around the tree. You put paper around the tree first, and then tar on the paper, with a cotton bandage under the paper. It is wingless. It crawls up the tree the first warm days in February, and if you will do that it will not get up the tree; but the better plan is to spray some anyhow.

C. C. COOK: I think you will have to renew the bandage at least two or three times in a year to make it effective. There are two or three broods or colonies of cankerworm, and I have seen them as late as October. If you don't take care there will enough of them stay to inoculate your trees for next year.

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J. B. FERGUS: I would like to ask Mr. Blair if it was the timber tent caterpillar which destroyed the timber in his part of the state. We classed it down in our section—an enemy that defoliated the trees there—as the timber tent caterpillar.

G. A. BLAIR: We have a tent caterpillar that makes its appearance on some of the trees. We have another class of worms there that does not make much protection for itself. You will find them in bunches on the trees. Those fellows choose the timber along the streams, but the ones that are doing the marked damage are the cankerworms.

DOCTOR BOHRER: What do you use for spraying?

G. A. BLAIR: I have used arsenate of lead with Paris green; either one of those will kill if you give them enough of it.

DOCTOR BOHRER: How do you prepare it?

G. A. BLAIR: Fifty gallons of water, and we put in about three pounds of arsenate of lead and one-half to three-quarters of a pound of Paris green—enough Paris green for the codling moth. If you do it and do it right I would increase the arsenate of lead to about that proportion.

DOCTOR BOHRER: I understand the Paris green will not kill the codling moth at all.

G. A. BLAIR: Did you ever try it, Doctor?

DOCTOR BOHRER: No, I never did. I heard it from a number of different ones.

G. A. BLAIR: That's the trouble; there is too much guessing about that. This Paris green will surely kill them if you will prepare it so they can get it. Most of the complaints arising from ineffectiveness of these arsenates are that they are not applied in the proper manner.

DOCTOR BOHRER: A gentleman this morning told me that he had used the Paris green, and that they seemed to improve and go right on with their ravages.

A MEMBER: Five pounds of arsenate of lead to 50 gallons of water will kill them.

C. A. BLACKMORE: I think I am the one the doctor refers to. I will just give you my experience with the cankerworm this last spring. In the first place I discovered that the trees were covered with them, and I went after them with a preparation which was guaranteed to kill them. I think the name was "Noxall," or something similar. Well, it had no effect, and then I got Paris green, and I used about five or six one-half-pound cans to a barrel of water, and I gave them two or three sprayings of this, and it had no effect. Afterwards I used about five pounds of arsenate of lead to fifty gallons of water, and I killed every one of them.

PRESIDENT HOOVER: Somebody sold you some green paint instead of Paris green.

G. A. BLAIR: I would like to ask Mr. Blackmore what kind of agitation he had when he used that Paris green. If you had poor agitation that Paris green settled to the bottom and did not do any good.

C. A. BLACKMORE: The Paris green was thoroughly agitated.

PRESIDENT HOOVER: Professor Dean, I would like to ask you how small the cankerworms would be when they would be in that clump the gentleman speaks about.

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PROF. G. A. DEAN: The cankerworm when first hatched is small indeed. When they web out first, from one-eighth to one thirty-second of an inch. It would be impossible to combat the cankerworm with a kerosene torch. We prefer the lead arsenate to the Paris green.

J. L. WILLIAMS: I want to say for the benefit of Dr. Bohrer that you could kill every one with one pound of Paris green to 50 gallons of water.

J. J. ALEXANDER: I would like to ask these gentlemen who have had a good deal of experience how you can tell whether Paris green is good or not. When we had the cankerworm on our trees till the leaves were all off and it looked like winter time, I used all the Paris green they had in our town, and maybe some green paint. I asked the druggist if he had any arsenate of lead, and he said yes, but it came pretty high. He said if I would go up and spray some plum trees for him he would furnish the lead. He fixed up a barrel. I did n't measure it nor weigh it. I dumped in all the Paris green he had, and that did n't bring any results, but they were all destroyed with arsenate of lead.

DOCTOR BOHRER: Here is a gentleman who says one pound of Paris green will do the work. It must be in the drug. I believe it would be important to fruit growers to find out who it is that keeps a good article. You don't want, when you have such an important thing as a crop of fruit on hand, to be disappointed in your spraying material.

PROFESSOR DICKENS: It seems to me the moral of this is, the fruit growers don't know where to buy good stuff. This discussion about buying spraying materials we have had for the last twenty years. It seems to me that the fruit growers in the different localities ought to see to it, for the sake of horticultural success, that there is enough good poison in that neighborhood, and just where it is to be obtained. If there is n't a horticultural society or association in the locality there ought to be. It is easy enough to buy good Paris green or arsenate of lead.

PRESIDENT HOOVER: It is n't hard to get good Paris green. There will be a guarantee under the pure food law. If it does not have that guarantee, don't buy it. I have n't heard many objections to Paris green or arsenate of lead from men who spray right along. The objection comes from men who have n't done much spraying, and they don't pay much attention to the time they apply the poisons. Now any man that will properly apply Paris green at the rate of 10 ounces to 200 gallons, mixed with four or five pounds of arsenate of lead to 200 gallons of water, will kill every cankerworm that will taste it. Those are absolute facts. Mr. Pierce, of the Department of Agriculture, laughed at me. He said it was useless. In the experiments that followed in the year 1910 I whipped Mr. Pierce's experience so badly with that spray that he followed in the year 1911, and last year also, and he has taken up with the idea of Paris green and arsenate of lead in combination for the cankerworm. The reason that I use the arsenate of lead with the Paris green is to make it a little more adhesive.

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TREES FOR STREET AND YARD PLANTING AND THEIR CARE.

By CHAS. A. SCOTT, State Forester, Manhattan.

As I travel about over the state, I am constantly being asked, "What kinds of trees are best to plant for shade in my yard?" The yard may be a lot 50 by 150 in some town or it may be a yard containing several acres that surround a country home. In either case the right kind of trees is a matter of great importance to the home builder and a question that deserves an intelligent answer. The question is usually followed by a statement that the maples, box elders and cottonwoods that were planted thirty years ago or more are now dying from some cause or other, though often not known. Other species have been tried and for some reason or other they failed to do any good.

The droughty condition that has prevailed throughout the state the past two years has been the cause of the death of a great many trees. The short-lived species have suffered the most, but the white elm, green ash, and even the honey locust have been badly injured in some sections of the state.

The insect pests have demanded a heavy toll. The borers of various kinds are active in the white elm, soft maple, cottonwood, black locust and other species, either locally or throughout the entire state. The scale insects are so numerous in certain sections that they are seriously injuring many valuable trees. The spring and fall leaf-eating caterpillars and the bagworm are also busy on the job.

The droughty seasons of the past two years, together with a ravage of insects, has done an immense amount of injury to street and shade trees. These losses only emphasize the need of exercising greater care in the selection of the species to plant in the future. A list of the names of desirable trees for street and yard planting does not fully satisfy the person that asks the question. He must know why the trees recommended are more desirable than others. Before this question can be answered intelligently, the character of the soil and climatic conditions of the planting site must be considered. The state of Kansas covers a large territory and the character of the soil and the climatic conditions vary in such a degree that it makes it necessary to vary the list of trees for the different sections of the state. A careful study of the conditions leads me to conclude that the state should be divided into three divisions in respect to the character of the soil and the climatic conditions as these relate to tree growth.

Division No. 1 should include the entire eastern part of the state extending as far west as the ninety-eighth meridian. This is approximately the line between Republic and Jewell counties extended south across the state. The west end of the state should be divided into two parts on an east and west line, the Arkansas river valley making the dividing line. The northwest section of the state makes division No. 2, and the southwestern section division No. 3.

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In this segregation, division No. 1 includes the territory within which the annual precipitation averages twenty-eight inches or over. The soil of this division is by no means uniform, but with few local exceptions it is good soil for trees. In division Nos. 2 and 3 the average annual precipitation is below twenty-four inches, but the character of the soil is markedly different. North of the Arkansas river, excepting within the other river valleys, it is a hard loam. South of the Arkansas river it varies from a sandy loam to light drifting sand.

Within each of these divisions the local conditions must determine what species of trees should be selected. The greatest factor of difference will be between the bottom-land and upland soils.

The trees named in the following lists are recommended for street and yard planting because they are long-lived species, perfectly hardy in the districts for which they are recommended, and as free from insects' attacks as any of our native trees.

FOR DISTRICT NO. 1.

Sugar or rock maple	*Acer saccharum.*
Norway or sycamore maple	*Acer platincides.*
Purple-leafed maple	*Acer schwedleri.*
White oak	*Quercus alba.*
Red oak	*Quercus rubra.*
Pin oak	*Quercus palustris.*
Burr oak	*Quercus macrocarpa.*
English oak	*Quercus pedunculata.*
Hackberry	*Celtis occidentalis.*
White elm	*Ulmus americana.*
Rock or cork elm	*Ulmus thomasi.*
English elm	*Ulmus campestris.*
Tulip tree	*Liriodendron tulipifers.*
Sycamore or plane tree	*Piatinus occidentalis.*
Orientalis sycamore	*Platinus orientalis.*
Black cherry	*Prunus serotina.*
Red bud	*Cereis canadensis.*
Kentucky coffee tree	*Gymnocladus dicicus.*
Thornless honey locust	*Gleditsia triacanthes.*
Basswood or linden	*Tilia americana.*
Linden or bee tree	*Tilia platyphyllos.*
White ash	*Fraxinus americana.*
Green ash	*Fraxinus lanciolata.*

The coniferous trees that are suitable for yard and ornamental planting are as follows:

White pine	*Pinus strobus.*
Red or Norway pine	*Pinus resinosa.*
Table mountain pine	*Pinus pungens.*
Pitch pine	*Pinus rigida.*
Western yellow pine	*Pinus ponderosa.*
Austrian pine	*Pinus austrica.*
Scotch pine	*Pinus sylvestus.*
Swiss mountain pine	*Pinus mugho.*
European larch	*Larix europea.*
Colorado blue spruce	*Picea parryana.*
White spruce	*Picea canadensis.*
Black Hills spruce	*Picea canadensis* (var. Black Hills).
Norway spruce	*Picea excelsa.*
Douglas spruce	*Pseudotsugo mucronata.*
White or silver fir	*Abies concolor.*

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Chinese arbor vitæ	*Thuja orientalis.*
Bald cypress	*Taxodium distichum.*
Dwarf juniper	*Juniperus communis.*
Red cedar	*Juniperus virginiana.*
Irish juniper	*Juniperus communis* (var. *hibernica*).
Swedish juniper	*Juniperus communis* (var. *suecica*).

FOR DISTRICT NO. 2.

Thornless honey locust	*Gleditsia triacanthos.*
Hackberry	*Celtis occidentalis.*
White elm	*Ulmus americana.*
Green ash	*Fraxinus lanceolata.*
Russian wild olive	*Ælæagnus angustifolia.*
Pagoda tree	*Sophora japonica.*
Osage orange	*Toxylon pomiferum.*
Red cedar	*Juniperus virginiana.*
Dwarf juniper	*Juniperus communis.*
Chinese arbor vitæ	*Thuja orientalis.*
Austrian pine	*Pinus austrica.*
Scotch pine	*Pinus sylvestris.*

FOR DISTRICT NO. 3.

Hackberry	*Celtis occidentalis.*
White elm	*Ulmus americana.*
Russian wild olive	*Elæagnus angustifolia.*
Russian mulberry	*Morus alba* (nonfruiting only).
Kentucky coffee tree	*Gymnocladus dioicus.*
Pagoda tree	*Sophora japonica.*
Osage orange	*Toxylon pomiferum.*
Red cedar	*Juniperus virginiana.*
Chinese arbor vitæ	*Thuja orientalis.*
Austrian pine	*Pinus austrica.*
Scotch pine	*Pinus sylvestris.*

In favorable locations in districts Nos. 2 and 3 the sycamore, *Platinus occidentalis*, can be grown very successfully.

The above lists are probably not complete, but they include nearly all of the species that can be grown successfully throughout the entire district in which they are listed. Several very desirable species grow successfully in the southeastern part of the state that are not found growing north of the central part of the state.

After having decided upon what species are to be used in the planting, the next point to look out for is good, clean, thrifty trees of proper size and good form. Perhaps no two persons will ever agree on the proper size of a tree for street or yard planting. If the character of the soil is congenial and the weather conditions ideal, trees from four to six inches in diameter and from sixteen to twenty-four feet in height may be safely planted. But during periods of dry weather and high winds trees of this size suffer great injury. In my judgment, trees of the broad-leaved species, about two inches in diameter, cut back to about eight feet in height, recover more readily from the shock of transplanting and in five years' time they are better trees than they would have been had they been three or four inches in diameter when set out. In districts Nos. 2 and 3 I would plant even a smaller sized tree, because of the prevailing high winds during the spring months.

Transplanted or root-pruned trees recover from the shock of being taken up and set out in a new location more quickly than wild seedlings

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and for this reason nursery-grown stock is always preferable to wild seedlings. Trees for the character of planting under discussion should have good straight stems and well-developed symmetrical crowns. Trees with crooked stems have a tendency to straighten when set out where they have plenty of room, but they never make such desirable trees as those that are straight to begin with.

The most satisfactory sized conifers to plant are once or twice transplanted trees that vary from two to three feet in height. Larger trees are handled with more difficulty and with less success. The failure of many to succeed in growing conifers is in my judgment due to the fact that too large trees were used, and too often not enough care is exercised to protect the roots from sun and wind.

Another safeguard in transplanting coniferous trees that should be carefully observed in Kansas, and especially in the western part of the state, is that of protecting the trees from the injurious effects of the wind during the first month or six weeks after they are set out. Every planter should bear in mind that an evergreen tree that is set out in full foliage suffers a greater shock in transplanting than do the deciduous trees when they are set out in dormant condition. Every leaf on the conifer transpires moisture. During the windy period transpiration goes on much faster than the roots are able to supply moisture until the tree has become thoroughly established. Consequently the need of protecting a newly set tree from the wind.

The means of providing this protection will vary somewhat with each locality and with the size of the trees transplanted. Empty boxes or barrels with the tops and bottoms knocked out set around the newly planted tree and securely anchored serve the purpose admirably, although unsightly in the yard for the time being. When smaller sized trees are set out, one or two shingles or barrel staves driven in the ground a few inches from the newly set trees on the south and southwest sides provide a wonderful protection. The value of this protection is clearly illustrated in the planting of the red cedars sent out by the state nursery in the spring of 1912.

Reports that have been received at the forester's office show that 83.9 per cent of these trees, planted in April, were in a thrifty growing condition in October. At the time these trees were sent out, instructions for their care and planting were sent out with each shipment, and in a majority of the cases the instructions were followed to the letter. The results secured in so unfavorable a year as 1912 fully confirm my belief that under favorable weather conditions and by properly handling the conifers it is not unreasonable to expect fully as large a per cent of the trees to withstand transplanting as can be expected of the broad-leaved species.

PREPARATION OF GROUND BEFORE PLANTING.

If a tree is expected to make a reasonable growth, it must be given congenial conditions under which to grow. The first of these to be considered is the condition of the soil in which it is planted. Trees demand a porous soil with good drainage and yet capable of supplying an ample amount of moisture. In yards and streets, unless considerable care is

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exercised in preparing the planting site, these conditions are not secured. To begin with, the hole in which the tree is to be planted should be large enough and deep enough to receive the roots spread in their natural position. The soil that is filled in about the roots must be tramped or firmed about them so as to bring the fresh soil and roots into immediate contact to prevent them from drying out and also to exclude the air from the soil.

In the western part of the state it is not necessary that the holes in which the trees are planted be completely filled. A depression about the tree is often of a decided advantage in holding surface water that accumulates during a shower until it has time to soak into the ground. However, the roots of the tree must be covered sufficiently to prevent them from becoming dry.

CULTIVATION.

After planting, careful cultivation is very necessary. This fact has too often been overlooked in the care of newly planted trees. It is unreasonable to expect them to compete with the native plants, which usually consist of weeds and grasses. On account of the location of street and yard trees the cultivation given must be by hand labor, and this will consist of keeping an area at least six feet in diameter about the tree thoroughly spaded throughout the summer. The value of this cultivation is two-fold. First, it prevents weeds and grass from occupying the ground intended for the tree, and thereby conserves all the soil moisture for the use of the tree.

This cultivation also prevents the soil from baking and drying out through surface evaporation. In many yards the sight of bare ground is objectionable, as the owner prefers to see the green sward cover every inch of the ground. However, for the good of the tree, he should by all means tolerate the cultivation of his trees for at least two or three years until they become thoroughly rooted and capable of competing with the grass sod. A small area about each tree kept under proper cultivation need not be an objectionable sight. It only becomes objectionable when cultivation is neglected and the ground is grown up in weeds or become baked and sun-dried. After two or three years of such cultivation, the ground may be again seeded to grass and the turf allowed to grow up to the stem of the tree.

PRUNING.

The sole purpose of pruning a tree is to develop it into some desired form. This can not be accomplished in one or two operations, but must be brought about gradually. The ideal form must be kept in mind and each year or oftener the removal of objectionable limbs is necessary. This should be done while the limbs are small so as not to make unsightly wounds. The tops of the more vigorous branches must be cut back from time to time to develop a symmetrical, well-balanced growth. When the pruning is properly done, a knife is the only tool needed. The use of a saw or axe is unnecessary and seriously detrimental.

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INSECTS.

Another feature in the care of trees that has been overlooked in shade and ornamental trees, but one that must be given attention, is protection against insect attacks. Next to the need of cultivation is the need of protecting the trees against insects. There is not a species but what has its insect enemies. It may be a borer that girdles the young trees, in which one or two insects in a single tree are sufficient to cause its death, or to so injure the tree that it is unfit for the purpose for which it is planted; other borers may attack the tree later in life in large numbers causing its death, as in the case of the elm, maple, and locust borers.

The scale insects, which are becoming more numerous year by year, are deadly foes to the shade trees. It is often the scale insects that are the original cause of the death of many of our valuable shade trees. When occurring in large numbers they deplete the vitality of the tree and make it a prey for the borers, which complete its destruction.

The leaf-defoliating insects are the most noticeable of all of the tree insect enemies, but, on the other hand, they are the most easily combatted, and their ravages may be checked before the injury becomes serious.

The foregoing statements lead up to the point that I wish to emphasize at this time, which is that the growing of street and yard trees demands as careful attention as the growing of fruit trees, and that if we expect to maintain beautiful shade trees in our streets and lawns we must begin with the planting of the tree, and give it the necessary care to protect it against all its natural enemies that we would give to other plants or animals, and it is not until we give our trees this care that we can expect to develop our ideal street and shade trees.

The need of this care has been recognized in the older sections of the United States. In the cities, villages, and even country communities, in eastern states the trees are cared for by properly authorized officials, which are known under various names, as city forester, or city street and shade-tree commissioner, or tree warden, town warden, etc.

In most of the communities, however, the necessity for such officials has arisen from the fact that some destructive insect or fungous disease has appeared which threatens the total destruction of certain species. In Massachusetts the gypsy and brown-tailed moths are destroying thousands of valuable trees, and the state has already spent millions of dollars in combating these insects. In Pennsylvania the chestnut blight threatens the destruction of the chestnut trees in that state, and recently the legislature appropriated a half million dollars to combat this disease.

In Kansas we have not yet experienced any such destructive outbreaks, but the general attacks by the elm-tree borer and the scale insects are causing an immense amount of injury, and some protection must be given the trees to prevent their ultimate destruction.

DOCTOR BOHRER: Do you not find that the white elm is as hardy a tree as you ever saw planted in western Kansas?

PROFESSOR SCOTT: If it were not for the borer I would say that the white elm was the best tree for western Kansas.

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DOCTOR BOHRER: Where do you get red cedars from?

PROFESSOR SCOTT: They are native; all the red cedars we have were grown from seed in the neighborhood of Manhattan.

DOCTOR BOHRER: They are not only good yard or shade trees, but they are going to be of immense value to the people of western Kansas.

PROFESSOR SCOTT: I might say that the red cedar is the only conifer indigenous to this state, and I recommend it very highly, especially for windbreaks.

PROF. B. B. SMYTH: I like the instructions Professor Scott gives for planting and raising trees in the western part of the state, especially in regard to watering of conifers. I have found in my experience of a good many years planting trees in Barton county and in Topeka the greatest difficulty in caring for evergreens after they have been planted is, next to having a herd of cattle come in and eat them up, to have women avoid watering them. I have nearly always instructed them not to water them at all, that it is not necessary, but they think that evergreen trees require more water. I would say first, however, in regard to the red cedar, that it is common in this state, at least indigenous to the state. There is one great difficulty now that I did not notice years ago, and that is the bagworm. There are very many groves of red cedars, beautiful trees, that have grown to a good height, 18 or 20 feet, and nearly ten feet across some of them, that are thoroughly infested with the bagworm, so much so that the trees are dying; and it seems to me that a little judicious care after the trees are planted ought to be all that is necessary to preserve them. It is easy to remove bagworms if they are attended to when they are first seen. The first thing you know the trees are all bare of foliage and in a dying condition. I would like to add two trees that are indigenous to Kansas, one in the eastern part of the state, the black walnut. The black walnut is not a handsomely shaped tree for parks in the city, but it is useful in its place and it grows freely in Kansas. I am not sure that we or any one else would have much success in transplanting black walnut, but the nuts can be placed where the tree is desired to be grown. The other tree that is good for the western part of the state is the Kentucky coffee bean. That was not mentioned for the eastern part but I noticed it for the western part. It grows as far west as Ness county, and the walnut also grows native as far west as Barton county, where we have a stream called the Walnut, and Rush county has a good many trees in it at the head of that stream; but Ness county has nice little groves of Kentucky coffee bean, as we call it. The foliage is beautiful, and I would like to see them increased in number in various parts of the state.

I want to say a word about white pine. All the trees, as he stated, require protection from the wind and sun, all conifers, when they are first planted. The white pine is a difficult tree to raise, but if it is well cared for and protected until the roots have reached the subsoil, away from the drying out of the surface, then the tree is almost sure to succeed. The tree is native farther north and in a cooler and moister climate than this.

PROFESSOR DICKENS: I don't want to knock the red cedar. I do want to forestall any talk that may be made that the cedar apple causes apple-

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leaf rust. I have not found any very serious attacks of the apple rust where spraying for scab and blotch has been properly done. I know orchardists who have cut down cedar trees, right good valuable trees, in the belief they were likely to be cause of loss from leaf rust in apple orchards. Any man in western Kansas who plants these trees can well forestall any trouble by picking off these "cedar apples" as they are sometimes called, which will be found in the spring on the foliage, any time while the tree is of size to be reached, and I would hate to see any one mark cedar off his list on that account.

J. J. ALEXANDER: In referring to the walnut for western Kansas. I have been out there in northwestern Kansas thirty-one years and the black walnut on low ground will do well, but whenever you get up off the second bottom, whenever the tap root strikes down to that dry strata below it stops.

President Hoover appointed the following committees:
Credentials: C. A. Blackmore, J. T. Tredway, B. F. Smith.
Election: C. C. Cook, J. B. Wheeler, B. F. Pancoast.
New Members: J. L. Williams.
Exhibits: F. W. Dixon, J. M. Graves, O. F. Whitney.
Audit: J. J. Alexander, D. D. Tuttle, Dr. G. Bohrer.
Obituaries: W. R. Martin, C. W. Murphy.
Resolutions: G. A. Blair, Albert Dickens, M. E. Chandler.

PROFESSOR DICKENS: I would like to move the appointment of a special committee to select flowers for one of the oldest members of the State Horticultural Society, who probably can not be long with us, Prof. E. A. Popenoe, who for the past ten or twelve weeks has been most of the time unconscious from a stroke of paralysis.

PRESIDENT HOOVER: I hardly think it necessary to make a motion. I will appoint Professor Dickens, Doctor Bohrer, and B. F. Smith.

HARDY SHRUBS FOR KANSAS.

By E. F. A. REINISCH, Topeka.

Kansas has such a favorable climate that it is difficult to find a point to begin and a place to stop in the long list of shrubs that are hardy and grow to perfection in our climate. I have therefore restricted myself to a certain small class of hardy shrubs, namely, "shrubs with ornamental fruit."

A plant producing showy fruit succeeding the flowers has, by reason of this, an increased value as an ornamental plant. While all shrubs are interesting more or less the year round because of their foliage, flowers, form of bush, color of bark, this class gives us bright fruits to cheer our hearts during the dull seasons of autumn and winter, and is therefore entitled to first consideration in making a selection for any kind of planting. If it were only a shelter belt we were to plant, it would be well to use some fruiting shrubs, and more so in strictly ornamental groups.

1. *Berberis thunbergii*—Japanese barberry. This species is remarkably beautiful for its low growth, spreadng habit, dense foliage and bril-

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liant scarlet fruit, which is often borne in great abundance, persisting into the winter.

2. *Berberis vulgaris*—common barberry. Shrug to eight feet; is variable in form, leaves and fruit, which latter ranges from scarlet to brownish red. Berries persistent till early winter. The flowers are small and yellow in both species.

3. *Callicarpa purpurea*—beautiful fruit. Shrub to four feet. The flowers of this shrub are pink, small and inconspicuous, but the fruit, a small berry in clusters, is of rare beauty. The color is a blending of lilac and violet. It requires a sheltered position but plenty of light to bear fruit every season. Those protected from north and west by trees and undergrowth have borne fruit abundantly every year. The fruit is discolored by the first freezing.

4. *Cornus mas*—cornelian cherry. A small tree; fruit scarlet, edible. All the species of dogwood are quite prolific fruit-bearers, the colors ranging in shades of red, yellow, blue and white. Most of them are fine for shrubbery plantings on account of their graceful habit and handsome foliage. Some have red bark in winter, showing most beautiful against the snow.

The genus *Cratægus*—hawthorn—is one of the most important ones for ornamental planting. Good habit, showy flowers and beautiful fruit. The following four species are growing in our parks and are admired by every one, especially when laden with scarlet fruit, which persists till long after the autumn-colored leaves have fallen to the ground and all nature is clothed in its somber winter tints.

5. *Cratægus coccinea*—scarlet thorn.

6. *Cratægus crus-galli*—cockspur thorn.

7. *Cratægus monogyna pauli*—Paul's scarlet thorn.

8. *Cratægus oxyacantha*—May thorn.

Many other species are of equal value in every respect, but have not been planted in the Topeka parks, except—

9. *Cratægus mollis*, which resembles *cratægus coccinea*, but drops its fruit early.

10. *Euonymus americanus*—strawberry bush, and

11. *Euonymus atropurpureus*—burning bush, are American species of decorative value, but as fruiting shrubs are far exceeded by the following:

12. *Euonymus europæus*—spindle tree of Europe.

13. *Euonymus hamiltoniana* (Maackii), a native of Manchuria.

These are among the very showiest of our fruiting shrubs, very variable, some retaining their brilliant autumn foliage until late after a number of frosts; some stay green until freezing takes off the leaves. The same is true of the berries, some bushes ripening early and others late. The early-ripening are generally darker to almost crimson, while the late-ripening berries are pink.

14. *Elæagnus angustifolia*—oleaster, also Russian olive. Shrub or tree to twenty feet, with silvery foliage and fragrant yellow flowers. The fruit, being a dull yellow when ripe in the fall, is not as showy as that of some other fruiting shrubs, but is borne in abundance, the branches bending with the weight of the harvest, and in combination with the silvery leaves are very beautiful.

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Lonicera—the honeysuckle, several species of which are conspicuous with their scarlet berries in fall.

15. *Lonicera tatarica*—tatarien, and

16. *Lonicera morrowi*—Morrow's honeysuckle, are bush forms.

17. *Lonicera japonica halliana*—Hall's fragrant,

18. *Lonicera sulliventi*—yellow flowering, and

19. *Lonicera sempervirens*—scarlet honeysuckle, are well-known climbers, pessessing great beauty besides their ornamental fruit.

20. *Ilex verticillata*—winterberry, a small bush with small scarlet berries in fall, which remain on the branches until midwinter.

21. *Photinia villosa*—a tall shrub with red berries in fall.

22. *Prunus pennsylvanica*—wild red cherry. This tree has a beautiful brown, shining bark and is very attractive in leaf, flower and fruit, which is red and eaten by birds.

23. *Prunus serotina*—wild black cherry. In 1908 a group of young trees in Gage park bore so prolifically that they shed their leaves in order to ripen the fruit, and were so rich and beautiful, with the branches drooping under the load of ripening cherries, that they were frequently taken for California pepper trees.

24. *Rosa humilis*—pasture rose, and

25. *Rosa lucida*, are two very similar species, upright to four feet, bright green leaves, single pink flowers, crimson fruit, which stays plump and bright on the bushes nearly all winter. In addition to these decorative characteristics, both species have dark crimson, shining bark, and planted back of *Kerria japonica*—yellow rose of Japan—with its light green twigs, makes a most charming contrast.

26. *Rosa rugosa*—jap rose, and

27. *Rosa rubiginosa*—sweet brier, have decorative fruit, and are desirable also for their other good qualities.

28. *Sorbus aucuparia*, and

29. *Sorbus americana*—European and American mountain ashes, are very beautiful in fruit as well as in leaf and flower. The orange-red berries are grouped in clusters and borne in such abundance as to bend the branches into a drooping position, which lends to the trees a peculiar grace.

30. *Sorbus arbutifolia*—red chokeberry, a medium-sized shrub, bearing small, bright red fruit, persisting until late in fall.

31. *Sorbus melanocarpa*—black chokeberry, similar to the former, with black fruit.

32. *Symphoricarpos racemosa*—snowberry. There is nothing in the plant kingdom, in the way of a fruiting plant, as delicate, as unassuming, and yet so rich, as this little shrub, laden with snowy white berries until the tips of the slender branches bend back to the ground, like a fountain, pouring out its abundant harvest of fruit.

33. *Viburnum opulus*—single snowball. A large shrub, though not as showy as the true snowball, is quite attractive when in bloom, but when in fruit with its many scarlet berries it rivals in beauty the best of them. There are many more species of this genus of decorative value as fruit bearers. Most have blue or black berries, but a number of them red, like *opulus*.

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34. *Celastrus scandens*—bittersweet of our woods, shrub to twenty feet. This climbing shrub is inconspicuous until its berries ripen in fall, when the orange covering of the berry opens and exposes the scarlet seeds, which remain in this position till early winter.

35. *Celastrus orbiculatus*—Japanese bittersweet. Very similar to the foregoing, only more prolific in fruit, and hence more showy.

36. *Solanum dulcamara*—European bittersweet. Rambling vine to six feet, with small blue flowers and showy scarlet berries.

The above thirty-six species comprise the most decorative and showy fruiting trees, shrubs and vines growing in the Topeka parks. They are not only desirable as material for ornamental plantings of groups, borders, screens and windbreaks, but also of great economic importance as food plants for the many kinds of birds which winter with us, and the many others that stop off here a short time for rest, food and shelter in their journey to the South.

DOCTOR BOHRER: May I ask the gentleman if there is a barberry bush growing in this state at the present time?

MR. REINISCH: We have it in all the states.

J. J. ALEXANDER: It is common.

DOCTOR BOHRER: I wish to say with regard to some of these shrubs, on some of the soils of the state it would be very difficult to grow them. Here in the eastern rain belt you have more rainfall than we do in the middle or western rain belt. On the lowlands, where it is not far to water, probably those shrubs, the most of them at least, can be successfully grown, but where it is from 30 to 50 or 100 feet to water they have got to be watered from the surface. I have put out snowballs a number of times, and what we call rose of Sharon, and if I pay strict attention I have no trouble in making them grow. I have a crimson rambler, and if I did n't give it several gallons of water a day during the dry season the roses would n't amount to anything. The snowballs, I have never had but two or three come into bloom, but those shrubs can be made to grow and be beautiful, ornamental, and that *Berberis vulgaris* is one of the finest medicinal plants. You will find that drug powdered in almost all the nasal snuffs for catarrh. To be successful on high lands and semiarid portions of the state, I think you will find it indispensable to put a plentiful supply of water on them.

J. J. ALEXANDER: I want to say for Doctor Bohrer's benefit that I live farther west than he does and farther north and higher than he does, and we have nothing that is hardier than that barberry. I have no trouble in growing most of these shrubs in our country. Of course, they need a little water when it is on high ground; the water you would give your lawn and premises is plenty to grow those hardy shrubs.

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THE BEN DAVIS APPLE.

By Louis Erb, Cedar Gap, Mo.

In years past, when many of the orchards in the Central West that are now in prime condition were started, there was perhaps no variety of apples more popular or more profitable than the Ben Davis.

Not only was the Ben Davis a favorite with the growers, but with the dealers and consumers as well. I remember the time, when I was in the fruit business in Memphis, some fifteen or twenty years ago, more than two-thirds of all the apples I sold were Ben Davis, and I could have sold more if I had been able to get them, and the prices generally were as good or better than those of most other kinds. It is, therefore, no wonder that in Missouri, Kansas, Illinois and Nebraska over seventy-five per cent of all the apples now in bearing are of the Ben Davis variety.

But times have changed in recent years and the Ben Davis is no longer profitable nor popular. The people don't seem to want it any more since the far western states and Virginia and West Virginia have come to the front as important factors in the apple-growing industry. The fact of the matter is the states beyond the Rocky Mountains have overdone the apple business, and I predict that when all the trees out there get into bearing it will be a question of how the growers will get them all picked without importing Chinese labor or training monkeys to do the work.

In the two Virginias, also, many of the rich valleys that formerly produced grain, grass or cotton have been converted into apple orchards, so that a large section of country east of the Mississippi river that in former years took our central western Ben Davis is being supplied with York Imperials, Winesaps, Mammoth Black Twigs and similar kinds from these states. Add to this the box apples from the Pacific coast states that now go in trainloads to the southeast, and you have the solution to a certain extent for the falling off in the demand for our Ben Davis.

I saw a recent report in a trade paper that Nashville alone, the capitol of Tennessee, held on December 1st over forty thousand boxes of western apples, compared to ten thousand boxes the previous year and none before that. Chicago, St. Louis, and especially Cincinnati, are fast becoming western box apple markets. New York, Philadelphia and Boston, which it would seem should naturally draw their supplies from Pennsylvania, New York and the New England states, have also gone daft on western box apples.

The varieties largely grown in these newer sections are preferred everywhere, even at a much higher cost, because of their supposed superior quality as eating apples. It can't be said that they look any better, because when grown to perfection there is no apple that beats the Ben Davis in appearance.

It is quite unnecessary to say to you that the Ben Davis has many excellent points in its favor. For instance, in normal seasons it grows

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uniform in size, fills the barrel up quicker than any other variety, keeps well, especially when held in cold storage, and for culinary purposes there are few kinds of apples that surpass it.

I go a little farther and say it is a good eating apple when not allowed to get too ripe. And I go farther still and make the bold assertion that the Ben Davis apple, with all it's so-called faults, would sell fairly well with other varieties even to-day if it were not for the prejudice that exists against it, largely on the part of the wholesale and retail dealers all over the country. They are the ones who have been primarily knocking it for years and it seems have finally succeeded in giving it a black eye. If the dealers are prejudiced and will not handle the Ben Davis as long as they can get other varieties you can not expect the public to consume them.

I know that an assertion of this kind will be criticised, for the dealers will say that it does not make any difference to them what kind of apples they sell as long as they can make a profit on them. Don't take any stock in this sort of talk. During a recent visit to one of the large cities, which is quite an important apple market, I looked around in nearly all the wholesale fruit houses and saw quite a display of New York, Michigan, and especially Virginia barreled apples, as well as western boxed apples, but no Ben Davis from Kansas or Missouri were in evidence, except in a few instances, and when I inquired, "Why don't you keep Ben Davis? they cost you less and you can sell them a little cheaper than the other kinds," the salesmen in most cases answered by saying, "We don't want to handle Ben Davis." How can you expect the demand for Ben Davis to keep up if most of the dealers in the larger cities refuse to handle them?

I am free to admit that the demand for Ben Davis on the part of the consuming public, since the Virginias and the far western states got into the apple game extensively, is not as good as it used to be, but I contend that if the dealers were not prejudiced against it and made only reasonable efforts to sell them the same as they do other varieties, the general falling off in the demand would not be nearly as great as it is. But in the language of a famous politician, "What are you going to do about it?"

I can see but two solutions to this problem, either organize selling campaigns among the growers in a general way so as to reach the consuming public, or top graft your Ben Davis trees into something else. One large grower down my way is going to adopt the latter course and has already bought grafts and hired enough grafters to work over about two hundred acres. Whether or not it will pay him in the long run I am not prepared to answer, but he is a "Progressive," said he voted for Roosevelt, and I hope he will win out. One thing is certain, the "Grafters" will "win out" as long as his money lasts whether he does or not.

For my part, I will not top graft my Ben Davis trees. I have been a champion of the Ben Davis too long for that. I would rather join an army of lusty Kansas or Missouri orchardists and club the dealers and consumers into submission and give them the choice to die an ignoble death or take our Ben Davis.

But there is one thing I will do while the taste for apples is in such a perverted condition. If I conclude to set out any more apple trees before

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entering the New Jerusalem, I will select varieties that are popular with the public and suit our soil and climate and let Ben Davis alone. Life is too short to waste time on an unappreciative public.

If many members of the Kansas State Horticultural Society are of the same mind, it occurs to me that the most appropriate subject to discuss at this meeting is, "What shall we do to be saved?" Or, in other words, what varieties of apples shall we plant in the future to take the place of the Ben Davis?

I understand that at the Missouri Fruit Experiment Station, at Mountain Grove, they have crossed the Ben Davis with the Jonathan and succeeded in producing a few specimens of very fine apples. It is possible that by the infusion of new blood supplied by the Jonathan our old friend, Ben Davis, may, in time, regain its erstwhile popularity. At any rate, it will be well for us to watch these experiments, for if by the crossing of these two varieties of apples, that we know do well in our soil and climate, we can combine the good qualities of the Ben Davis and the good qualities of the Jonathan, we will have an apple that we can be proud of and which will enable us to defy the rest of the apple-growing sections in this land.

Having always stood up for the Ben Davis as one of our best all-round commercial apples for the Central West, I trust that what I have said concerning it will not be misconstrued.

If I had my way about it the Ben Davis would be as popular to-day as it ever was. In fact, if I had the power I would have state and national laws enacted sending any person to jail who refused to buy or eat Ben Davis apples. But, unfortunately, I can't control public sentiment. I say public sentiment advisedly, because the Ben Davis apple is as good to-day as it ever was. Public sentiment, although perverted, is against it, and there we are. Public sentiment, my friends, is a queer thing. When it runs in a certain direction, right or wrong, it can not be stopped. I think you will all admit that we had a fair proof of this at our November election. Public sentiment decided that, for a time at least, Wm. Taft and Theodore Roosevelt should keep company with Ben Davis in the same box.

Now the thing for us orchardists in the Central West to do is to change public sentiment, or the character of our Ben Davis, either by crossing or replacing it with other varieties. Which is best and most practical, under existing conditions, I leave to the good judgment of this society.

THE POLLINATION OF APPLES AND PEARS.

By GEORGE H. WEST, Colorado Springs, Colo.

The study of orchard pollination is a very necessary part of successful commercial fruit growing. No experience is more disheartening than to see our trees loaded with bloom in the spring, and then either not set fruit or drop the major part of it from lack of fertility before maturity. The writer is only a fruit grower and an observer, but has learned there must be eternal vigilance in the essential things for success in growing fruit. What is here written is simply a digest of facts from eminent

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authorities, little of which is yet available in concrete form to the fruit growers.

In 1793, at Berlin, Dr. C. K. Sprengel, professor of medicine and botany at Halle University, Germany, published his work, "The Secrets of Nature Revealed in the Structure and Fertilization of Flowers," showing the essential part that insects play in pollinating flowers. He observed that in certain species of plants cross-pollination necessarily took place, but did not realize the advantage of this to the plants, nor know the importance of his discoveries.

Later, Thomas Andrew Knight (1758-1838), a graduate of Baliol College, Oxford University, England, and later president of the Horticultural Society, published, among other works, "A Treatise on the Culture of the Apple and the Pear." After his death his "Physiological and Horticultural Papers" were published. He realized somewhat the benefits of cross-pollination. Among the writings of Professor Joseph Gottlieb Koelreuter, a German botanist (1733-1806), published in 1811, he refers to the same law of nature, as does also Herbert later on.

The first real awakening on the subject of the cross-pollination of flowers, however, came with the great discoveries of the eminent naturalist, Charles Robert Darwin, F. R. S. We refer you to his works, "Origin of Species by Means of Natural Selection" (1859), in which cross-fertilization is emphasized; "Fertilization of Orchids" (1862), showing the fertilization by insects; "The Variation of Plants and Animals under Domestication" (1867); "The Effects of Cross- and Self-Fertilization in the Vegetable Kingdom" (1876), and "Different Forms of Flowers in Plants of the Same Species" (1877). The facts and principles covered in Darwin's "Cross- and Self-Fertilization" have been the main basis, stimulus and incentive to all research since then along this line. Darwin's investigations and writings demonstrated certain important laws regarding plant life now universally accepted. Among them: (1) Nature abhors perpetual self-fertilization, "Fertilization of Orchids" (1862); (2) continuous self-fertilization results in inferior and less fertile offspring; (3) cross-fertilization is necessary for the production of healthy seedlings. Other valuable works including this general subject are Hermann Mueller's "Fertilization of Flowers," Sir John Lubbock's "British Wild Flowers in Their Relation to Insects," and Kerner von Mirlaun's German work on "Plant Life."

Patient observation and experiments by leading naturalists established the fact that certain plants are self-sterile, *i. e.*, are not capable of fertilization, fruitage or reproduction by pollen from their own bloom. Focke made a list of fifty-seven species of self-sterile plants from other leading authorities and from his own observations. This valuable list is published, with the authorities, in Professor Waite's Bulletin No. 5, here referred to.

PEAR POLLINATION.

The most thorough, valuable and more recent publication on cross-pollination is by Merton B. Waite, special agent, Division of Vegetable Pathology, United States Department of Agriculture, being Bulletin No. 5, "The Pollination of Pear Flowers." It is a detailed report of

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experiments made in 1891 and 1892 on various orchards in New York and Virginia, with thirty-six named varieties of pears, including those most commonly and commercially grown in this country. These experiments were made with daily records of temperature and rainfall. There are four ways in which blossoms of fruit trees may be fertilized: (1) By any flower pollinating itself; (2) by pollen from other blossoms on the same tree; (3) by pollen from the flowers of another tree of the same variety; and (4) by cross-pollination, or pollen from the bloom of another tree of the same species but of a different variety. Obviously, as a general rule, if an apple or pear flower can not be fertilized by its own pollen, it is sterile also as to the pollen both from other flowers on the same tree or from other trees of the same variety. The proof follows herein.

In the experiments by Professor Waite, the pear-bud clusters were covered, a day or two before the flowers opened, with bags of three sorts—mosquito netting, cheesecloth, and paper—the former maintaining about normal conditions except that they excluded all but the most minute insects. These bags were 10 to 18 inches long, and enclosed fruit spurs with from two to ten bud clusters. Each sack was labeled and numbered and accurate records were kept. The number of clusters inside the bags and a number of clusters outside the bags, of about the same character, and selected at random on each tree, were recorded, as were also the fruits produced by each.

The flowers of any variety generally bloom well together, on pears the whole time of blooming from opened flowers until the petals are fallen being generally eight or nine days. "On the first day a few flowers will come out; the next day finds the tree white with bloom; four more days of fine weather and the pollen will be about all shed, and the work of pollination by insects practically finished. . . . Generally the flower does not drop its petals until three or four days after all the anthers are burst." (Waite).

Professor Waite's experiments in 1891 were to ascertain the value to the pear flowers of insect visitors and to determine what varieties of pears were self-sterile and which were self-fertile. The experiments in 1892 cover the same purpose but show also the value of cross-pollination and which of the varieties are more potent and valuable factors in pollination one with another. Of the 36 varieties of pears so tested, on 142 trees, only nine proved self-fertile above five per cent, and these showed a greater fertility where the bloom was exposed to insect visits. These self-fertile kinds are here given together with the average percentages of fruits grown on the tests:

Pear variety.	Self-pollinated fruits.	Fruits from insect visits.
Angouleme (Duchess)	8	10
Buffum	16	23
Doyenne D'Alencon	13	27
Flemish Beauty	11	21
Heathcote	15	15
Le Conte	6	13
Manning's Elizabeth	31	30
Tyson	13	30
White Doyenne	7	14

But the pears so grown by self-fertilization were shown to yield less and the fruit to average less in size, with seeds fewer, smaller, often shrunken or no seeds. Angouleme fertilized with pollen of the same vari-

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ety from another tree showed no greater fruitage, but when cross-fertilized with Anjou pollen yielded 22.5 per cent fruit. Le Conte, hand-pollinated from the same tree, gave 24 per cent fruit, and on two crossings with Anjou pollen yielded 41 and 10 per cent respectively. Buffum crossed with Bartlett pollen yielded 53.5 per cent fruit.

Of the varieties that proved self-sterile on these tests, when the blossoms were covered with sacks, five kinds were hand-fertilized with pollen of the same variety either from the same tree or from other trees. The Anjou, Lawrence and Seckel yielded no fruit. The Kieffer, on a test of 25 blossoms, produced one pear, or four per cent. (Waite cites the fact, however, that Kieffer pear trees, grown on Le Conte roots, have proved in the South to be self-fertile, showing possibly the influence of stock on cion.) The Bartlett, however, set no fruits on three tests with its own pollen, from the same flower, from other flowers on the same tree, and from another tree. These tests were on 18-year-old trees, somewhat reduced in vigor by leaf blight the previous season. Bartlett, tested three other times, on trees whose entire tops were of vigorous young growth, with pollen both from the same tree and from other trees, gave in two cases 14 per cent each and 29 per cent on the third.

To show the benefits of cross-fertilization and the relative value of pollination by insects and by hand from selected varieties of pears, I submit the following data from Waite's report, showing the average percentage of fruits produced, these tests being made on the self-sterile varieties:

	Insect pollination.	Cross-pollination by hand.
Anjou	16	24
Bartlett	14	53
Clairgeau	16	25 (Angouleme)
Clapp's Favorite	14	31 (Bartlett)
Keiffer	17	67
Lawrence	9	6
Le Conte	11	17
Seckel	9	12 (Bartlett)
Winter Nelis	13	50

Where the pears tested were in solid blocks with large acreage of the same variety, there were naturally poor results from insect visits. That great law of Darwin's of "natural selection" is shown in these tests, some of the self-sterile varieties proving barren also at times to the pollen of some other varieties. Also each variety tested seemed to have some especial affinity for one kind more that another. Thus, Bartlett gave no fruits on one test crossed with Le Conte (21 flowers), nor on cross tests each with Seckel (37 flowers), and Clapp's Favorite (3 clusters); while on a second test with Seckel crosses (18 flowers) it gave 33 per cent fruitage, and four other tests of crosses with Clapps' Favorite (101 flowers) gave from 43 to 86 per cent fruit. Bartlett crossed with White Doyenne gave 100 per cent fruit. Thus also Lawrence was barren to two cross tests with Kieffer (4 clusters), and one cross test each with Sheldon (1 cluster) and Angouleme (12 flowers). Le Conte proved infertile on one cross test with Seckel (12 flowers).

The other varieties of pears, either wholly self-sterile when their blossoms were covered, or showing up to 4.4 per cent fertility (Diel), as shown by Waite's experiments, gave the following average fruit per-

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centages, when exposed to insect visits: Bose, 8; Boussock, 15; Brockworth, 3; Columbia, 10; De la Cheyne, 0; Diel, 5; Doyenne Sieulle, 10; Easter, 7; Gansell's Bergamotte, 8; Gray Doyenne, 14; Howell, 16; Jones, 19; Louise Bonne de Jersey, 24; Mount Vernon, 15; Pound, 31; Sheldon, 7; Souvenir de Congress, 21; Superfine, 17; Wilder, 15. These figures certainly show the benefits of cross-pollination.

Waite says, "It has been proved that cold weather during the flowering period renders some plants incapable of self-fecundation, although they still retain the ability to be cross-fecundated." The pollen from two varieties may be absolutely self-sterile and at the same time perfectly cross-fertile. Thus Kieffer crossed with Bartlett pollen gave 100 per cent on one of Waite's tests (5 clusters). Of the varieties included in Waite's experiments the following proved good pollinizers: Angouleme, Anjou, Bartlett, Clapp's Favorite, Easter, Sheldon, White Doyenne.

The pears grown under these experiments were thoroughly tested, the self-pollinated being compared with the cross-fertilized. In a general way there was little difference in color or flavor. The self-fertile pears had usually fewer seeds, which were often imperfect and shrunken. Some had no seeds. The cross-fertilized fruit had generally plump seeds and the full number. The shape was sometimes altered by the crosses, and the size and weight in most cases were materially increased. The Waite bulletin gives many views of these pears and of their seeds, with tables of comparative weights. A brief digest of these figures is as follows, the weights being given in grams:

Angouleme—self-pollinated, 162; crossed with Anjou, 216; crossed with Seckel, 141.

Anjou—self-pollinated, 156; crossed with Bartlett, 174; crossed with Angouleme, 142.

Bartlett—self-pollinated, 100; crossed with Anjou, 116; crossed with Angouleme, 134; crossed with Clapp's Favorite, 134; crossed with Easter, 168; crossed with White Doyenne, 89.

Buffum—self-pollinated, 36; crossed with Bartlett, 38; crossed by insects, 39.

Doyenne d'Alencon—self-pollinated, 56; exposed to insect visits, 55.

Heathcote—self-pollinated, 48; exposed to insect visits, 50.

Winter Nelis—crossed with Angouleme, 43; and crossed with Bartlett, 57.

All such experiments are naturally very limited in their scope, and the results are modified in each case by varying features of weather, wind, soil, and the fertility and vigor of each tree on which the tests are made. The general truth remains, however, of an increase both in yield and size of fruit from cross-fertilization. What varieties may be best for cross-fertilization one with another involves, therefore, both these factors, since certain crosses increase the yield while decreasing the size. Thus Anjou crossed with Bartlett, gave an increase of 18 grams in average size on a yield of 17 per cent, while Angouleme cross yielded 30 per cent, yet decreased the average size 14 grams. Bartlett crossed with White Doyenne gave an average of 78 per cent fruitage, yet reduced the average size of the pears 11 grams; the crosses with Anjou, giving 74

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per cent yields, increased the average size but 16 grams, while the Clapp's Favorite crosses, with an average of 67 per cent yield, and Angouleme, with 60 per cent average, gave each an average increase of 34 grams in weight. The cross with Easter, however, yielding 46 per cent of fruit, gave an average increase in weight of the pears of 68 grams. Winter Nelis crossed with Angouleme gave 43 per cent fruitage, and these pears weighed an average of 43 grams, while the Bartlett cross gave 56 per cent yield, with an average weight for its fruit of 57 grams. These tests would be, however, of more value were they made on entire trees, since the fact of a tree heavily loaded with fruit giving a smaller pear than one scantily fruited is so well known.

Among the leaders in research as to self-fertility and pollination of orchard fruits is S. W. Fletcher, now director of the Agricultural Experiment Station at Blacksburg, Va. His papers, "Self Sterility, an Orchard Problem" (report of New Jersey State Horticultural Society, 1899), "Pollination in Orchards" (Bulletin No. 181, Cornell University Agricultural Experiment Station, March, 1900), and his later report on the "Pollination of Bartlett and Kieffer Pears" (report Virginia Agricultural Experiment Station, 1909-1910), are among the few and valuable publications on this subject. Others who have made able research along this line are Luther Burbank, Goff, F. A. Waugh and Kerr (twelfth report Vermont Agricultural Experiment Station), Craig, Crandall, Heidemann, W. W. Munson ("Secondary Effect of Pollination," annual report, Maine State College, 1892), S. A. Beach, C. P. Close, U. P. Hedrick, and C. I. Lewis and C. C. Vincent, both of the Oregon State Agricultural Experiment Station at Corvallis, whose bulletins are referred to herein later. H. Mueller-Turgau, O. Kirchner and Doctor Ewert, all of Europe, have also carried on many investigations and experiments regarding fruit pollination.

Professor Fletcher's Bulletin No. 181 gives the results of investigations continued for three years under L. H. Bailey, professor of horticulture, Cornell University, New York, and covering pollination work at Ithaca, N. Y., in 1899. This report names, among the pears that tend to self-sterility and are "risky varieties," Angouleme (Duchess), Bartlett, Clapp's Favorite, Idaho, Kieffer, and Nelis—this being both from experimental work and from the reports and experiences of over five hundred fruit growers. He states that Kieffer is a good pollinizer for Bartlett, Angouleme, Clapp, Nelis and like varieties, when they bloom together. The experiments made showed Seckel crossed with Kieffer pollen gave larger fruit than when crossed with Lawrence; that Clapp crossed with Kieffer was also larger than when crossed by either Lawrence or Louise Bonne; that Howell crossed with Clapp gave fruits of nearly twice the size of those from Bartlett pollen; that Bartlett crossed with Angouleme gave larger fruit than when crossed with Sheldon. He names as some combinations which have been successful in the commercial orchards of the country, Bartlett with Nelis, Flemish Beauty, Easter and White Doyenne; Idaho with Bartlett; Kieffer with Le Conte and Garber. In forty-five different crosses made in 1899 he notes no influence of the pollen on fruit flavor, nor any constant differences in color, shape or

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season of ripening. He says some growers plant every tenth row to the pollinizer, but the proportion should usually be greater, say every third row in using Garber or Le Conte to pollinate Kieffer. He notes the imperfect seeds in self-pollinated fruits, and reaches the same conclusion as Waite, that cross-pollination gives better results with nearly all varieties, be they self-sterile or self-fertile. He adds that an indication of self-sterility is the continued dropping of young fruit from isolated trees or solid blocks of any variety. His suggestions are (*a*) not to plant orchards with solid blocks of any variety; (*b*) if established orchards are unfruitful from self-sterility, to graft another variety in each tree; (*c*) to keep fruit trees well nourished, but not to stimulate them to overvigorous growth.

The experiments forming the basis of his last report (1910), were made while he was connected with the West Virginia Agricultural Station in 1903, and with the Michigan Agricultural Station in 1906 and 1907. This work was largely to determine the self-fertility of Kieffer and Bartlett pears, as also to ascertain the relative value of different varieties on cross-fertilization with them. These experiments were in 1903, near Martinsburg, Va., and in the orchards of the Michigan Agricultural College, East Lansing, in 1906 and 1907. The conclusions reached in the report are based upon results from 8275 hand-pollinations of Kieffer and 9867 hand-pollinations of Bartlett pears, the pollen being applied with camel's-hair brushes. The entire work of two other seasons was lost (1904, 1905) by late freezes, after the pollination was done. The report shows, Bartlett on 3081 tests fertilized with its own pollen, produced only six small pears, or one fruit to 513 blossoms; on 4133 tests with Kieffer pollen one fruit to ten blossoms; one in seven from Anjou pollen; one in nine from Lawrence pollen; one in ten from Duchess. The average weights of the pears grown in these tests were from the Bartlett pollen 2 ounces, from Kieffer 3 ounces, from Anjou pollen 3¾ ounces, and from Duchess and Lawrence 3½ ounces. The fruits from Bartlett pollen had shrunken seeds, which failed to germinate. To further test the self-sterility of the Bartlett pears, four large eighteen-year-old trees of this variety were completely covered, just before the blossoms opened, two with unbleached muslin sheeting, and two with mosquito netting. The coverings were tied closely around the trunks and were then banded with tanglefoot, to exclude all insects. The trees covered with sheeting were capable of bearing at least two bushels each that year. The blossoms on several large limbs were hand-pollinated with Bartlett pollen. Lawrence pollen was applied to 48 blossoms under the muslin and to ninety blossoms under the netting, and enclosed in paper sacks. These trees were shaken vigorously twice a day during the blooming period, to help distribute the pollen. The sheeting was removed when the petals dropped. Eight large pears grew from the Lawrence pollen and seventeen from balance of the tree under the sheeting, of an average weight of two and one-half ounces, seven of these on hand-pollinated limbs. Two limbs of each tree were left outside the netting and were loaded with fruit, averaging 3½ ounces in weight. The two trees covered with netting grew seven pears from the blossoms that were hand-pollinated, weighing 2½ ounces aver-

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age, and 75 pears averaging four ounces, mostly from the outside of the tree, where partly exposed to insects through the mesh. The 90 Lawrence pollinated blossoms grew 29 pears of an average weight of 3¾ ounces.

THE KIEFFER PEAR TEST.

This test showed only five fruits grown from 1268 blossoms hand-fertilized with Kieffer pollen, or one to 253; 2764 blossoms crossed with Duchess, and 2363 crossed with Bartlett, each gave one fruit to five blossoms; Clairgeau on 1460 crosses gave one to three; Lawrence one to six; Anjou one to four; Le Conte and Garber each one to seven. Unfortunately, the larger part of the crossed fruits were picked by the orchard owner, by mistake, when harvesting, so the relative weights were not secured. Notes made on August 3, however, report that the self-pollinated fruits were very small.

In 1907 one large Kieffer tree was covered with muslin sheeting and treated exactly like the four Bartlett trees. Five small pears were borne, without viable seeds, beneath the sheeting, three of these being from hand-pollination. Forty-five blossoms hand-pollinated with Lawrence and covered with paper sacks gave twelve large pears. Two small branches outside the tent bore fifty large pears.

In closing this report Fletcher remarks that Anjou, Lawrence, Duchess, and Kieffer are satisfactory varieties for planting with Bartlett for pollination, and Le Conte, Garber, Lawrence, Bartlett, Duchess, Anjou and Clairgeau for planting with Kieffer, all this provided they bloom at the same time.

Professor C. I. Lewis (Oregon Agricultural Station, Bulletin No. 111, Orchard Management), reporting on pear investigations there says Comice is absolutely self-sterile. He also says, "The Bartlett and Anjou intercrop very nicely, also Winter Nelis and Comice. Howell and Winter Nelis seem to go well with any varieties that bloom at the same time." He adds that crossing the Bartlett and Bosc has given unsatisfactory results.

POLLINATION OF THE APPLE.

Professor Waite refers, in his bulletin on pears (p. 81), to experiments made by him in cross-pollination of apples and quinces, and says, "The varieties of apples are more inclined to be sterile to their own pollen than the pears. . . . In the majority of cases no fruit resulted from self-pollination." I find no separate report by him on apples, however.

Among others who have made observations and experiments in the cross-fertilizing of apples are Professors Charles W. Garfield and L. H. Bailey, both of Michigan Agricultural College (before 1894), and Prof. A. A. Crozier (1888), of Iowa Agricultural Experiment Station (Bulletin No. 3, 1892).

Professor Fletcher, in his Bulletin No. 181, lists these varieties of apples as *tending* to self-sterility: Belleflower, Primate, Spitzenberg, Willow Twig, and Winesap. He also names the following as having exceptionally good records for fruitfulness when planted in solid blocks, other conditions being favorable: Baldwin, Ben Davis, Fallawater, Janet, Oldenburg, Rhode Island Greening, Red Astrachan, and Smith's Cider.

There is no detail report in the bulletin on apple pollination, but

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Fletcher says: "Setting aside the usual gain in size resulting from crossing, we wish to know whether there will be any change in the shape, color, quality and season of ripening of the fruit. . . . It does not necessarily follow that sweet and sour apples are due to cross-pollination, nor that the russet, on Greening apples borne on the side of the tree next a Roxbury, was produced by the influence of the Roxbury pollen."

The bulletin contains plates showing a great increase in size of Stark from Wagener pollen, compared with the fruit grown from its own pollen. Longfield also shows a great comparative increase in size from Greening pollen. Tolman Sweet, however, showed no benefit from cross-pollination with Wagener. Fletcher says, "In 1899, Hyslop Crab pistils which were fertilized with pollen from the Tompkins County King grew into fruits of the usual crab size." He says, "The three self-pollinated Longfields shown had but five sound seeds, while the two crossed specimens had seventeen sound seeds. . . . In case the ovules in one cell of an apple or pear core are not fertilized, that part of the fruit adjoining is often stunted, and the fruit becomes lopsided."

Professor Fletcher's 1910 report refers (p. 223) to the hand-pollination in 1903, at Martinsburg, Va., of 5068 blossoms of Grimes Golden. This was a total failure, unfortunately, likely by late freezes after the pollination was done (p. 215).

Among the more recent and most valuable publications on apple pollination are those from the Oregon Agricultural Station at Corvallis, being Bulletin No. 104, "Pollination of the Apple" (1909), by C. I. Lewis and C. C. Vincent, Bulletin No. 111, "Orchard Management," by C. I. Lewis (1911), and Circular Bulletin No. 20, "The Pollination Question" (1912). Bulletin No. 104 includes a series of experiments made in 1907 and 1908, in hand-pollinating eighty-seven varieties of apples (all these tests using the sack method of Waite and Fletcher, as heretofore explained), in Oregon orchards, on tests for self-fertility. There were 7175 sacks covering blossoms, one-half of each variety being hand-fertilized with its own pollen, the other half so enclosed fertilizing itself. There

VARIETY.	Number bags.	Fruits set.	Fertility.	Pollen bearers.
Arkansas Black	100	.....	Self-sterile	Medium.
Baldwin	200	14	Self-fertile	Medium.
Ben Davis	100	3	Part self-fertile	Medium.
Belleflower	50	.....	Self-sterile	Medium.
Grimes Golden	100	14	Self-fertile	Shy.
Gravenstein	50	.....	Self-sterile	Shy.
Gano	50	.....	Self-sterile	Abundant.
Jonathan	200	.....	Self-sterile	Medium.
Keswick Codlin	50	40	Self-fertile	Shy.
Missouri Pippin	50	.....	Self-sterile	Medium.
Mammoth Black Twig	100	.....	Self-sterile	Abundant.
Newtown	100	66	Self-fertile	Medium.
Ortley	100	.....	Self-sterile	Medium.
Oldenburg	100	5	Self-fertile	Medium.
Rome Beauty	100	.....	Self-sterile	Abundant.
R. I. Greening	100	.....	Self-sterile	Medium.
Stark	100	1	Part self-fertile	Medium.
Spitzenberg	100	7	Part self-fertile	Medium.
Tolman Sweet	100	.....	Self-fertile	Abundant.
Wagener	50	3	Part self-fertile	Abundant.
Willow Twig	50	2	Part self-fertile	Medium.
Wealthy	50	.....	Self-sterile	Medium.
Winesap	100	.....	Self-sterile	Shy.
York Imperial	100	.....	Self-sterile	Abundant.

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were only 375 fruits set from these tests, there being little difference in the results from the two methods of pollination. This paper is already so long we give but a partial report, including most of those commonly grown on a commercial scale in the western United States.

CROSS-POLLINATION EXPERIMENTS.

These experiments were made to determine the relative value of the different varieties, one with another. A brief report of the results is here given on a percentage basis, showing the average fruits set:

Spitzenberg, with Baldwin pollen, 56; Ortley, 67; Arkansas Black, 61; Red Cheek Pippin, 58.5; Newtown, 38.5; Jonathan, 62. Other tests proved that the following varieties crossed satisfactorily with the Spitzenberg: Arkansas Black, Baldwin, Bottle Greening, Delicious, Gravenstein, Hanwell Souring, Hydes Keeper, Jonathan, King, Mammoth Black Twig, Newtown, Ortley, Red Cheek Pippin, Stark, Wagener and York Imperial. Self-pollinated Spitzenbergs proved to be inferior in size and ill-shaped compared with the crossed apples.

"The Spitzenberg crosses made by Jonathan pollen resembled the Jonathan in color, and with the Arkansas Black crosses took on a darker color." Crosses with Newtown pollen were not as deeply colored as these. The self-fertile Spitzenbergs were practically devoid of plump seeds, while the seed from the crosses was plump and weighed, on an average, over five times as much. A comparison of the weights of some of the crosses is given in grams: Spitzenberg, self-pollinated, 100; crossed with Newtown, 126; with Arkansas Black, 128; with Jonathan, 144; with Baldwin, 157.

The report on the Yellow Newtown crosses is briefly as follows, the results being given in percentages of fruits set: With Ben Davis pollen, 86; with Grimes Golden, 56; Jonathan, 78; Spitzenberg, 46; White Belleflower, 93, and White Pippin, 75. In 1907 it was found that the Newtown would also cross well with Arkansas Black, Bailey's Sweet, Hanwell Souring, Hoover's Red, Hyde's Keeper, Maiden Blush, Pewaukee, Pumpkin Russet, Twenty Ounce and York Imperial. "No perceptible difference was detected in the quality, flavor and color of the self-fertile Newtown apples as compared with the cross-pollinated apples." Out of forty self-fertile Newtowns, thirty were inferior in size. These apples contained only thirteen plump seeds. The average weight of the cross-fertile seeds was forty-six times greater. The comparison in weight of the Newtown cross fruits is given in grams, thus: Yellow Newtown, self-pollinated, 73; with Belleflower pollen, 104; with Spitzenberg, 147; Jonathan, 162; and Grimes Golden, 173.

The bulletin notes that the practice in planting Oregon orchards for effective pollination, say when three varieties were planted, was to put alternately two rows of each variety. This valuable bulletin gives long lists of the bloom periods in Oregon of the various kinds of apples, pears and cherries grown there. We copy in part a list of other successful crosses of apples made in Oregon, thus:

Variety crossed.	Variety of pollen.
Black Ben Davis	Hyde's Keeper, Willow Twig.
Grimes Golden	Twenty ounce.
Jonathan	Ben Davis, Yellow Newtown, Spitzenberg.

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Variety crossed.	Variety of pollen.
Keswick Codlin	Bottle Greening, Lady Apple.
Maiden Blush	York Imperial.
Mammoth Black Twig.....	Mann, Red Astrachan, Hanwell Souring.
Mann	Shiawassee, Haas, Pumpkin Russet.
Ortley	Haas.
Winesap	Arkansas Black.

In Bulletin No. 111 Professor Lewis says: "The Yellow Newtown is pollinized very nicely by Ortley or Grimes Golden, and especially well by White Winter Pearmain. This latter variety has so far proved to be a splendid pollinizer upon every variety tried. The Ben Davis, on the other hand, has proved at times to be rather poor with most varieties, being somewhat weak in vitality."

Circular No. 20 suggests that reciprocal action in pollination be considered in orchard planting, instancing Winesap as producing very little pollen, while Rome Beauty produces plenty. The former, therefore, would receive an abundance of Rome Beauty pollen, but the latter would receive little from Winesap in return. It also suggests due consideration of the age at which varieties bloom, as apples blooming at about the same season may not flower at the same age.

POLLEN CARRIED THROUGH THE AIR.

Some interesting experiments were made under Lewis and Vincent, in Oregon, to determine the action and value of the wind in tree-fruit pollination. Two large trees were selected, a Rome Beauty and a Mammoth Black Twig (two varieties known to grow abundant pollen). The trees were at the height of their bloom period, and a strong wind was blowing. Glass slides 1 x 3 inches were smeared with vaseline and placed at different distances and heights from the trees. The slides were exposed for twenty-four hours, and then examined with a microscope for pollen grains. The result showed but sixteen pollen grains on a slide 4 feet from the tree trunk and on the ground. This was the maximum. The minimum results were seven grains at a distance of 30 feet from the tree and 6 feet from the ground, and six grains at 20 feet distance and 9 feet high.

To verify this experiment another test was made. All of the petals and stamens were removed from the entire 1500 blossoms on a seven-year-old apple tree, leaving it exposed to both wind and insect visitation. This tree was 20 feet from another that bloomed profusely. "Out of the 1500 blossoms emasculated only five set fruit. During the whole period that the pistils of these blossoms were receptive, only eight bees visited the tree. More than twice that number were seen in one-half hour on a tree 20 feet away. . . . Waugh, of Massachusetts, demonstrated that plum pollen was not transmitted through the air in sufficient quantities to insure self-pollination. The author's experiments with plums, as outlined by him, arrived at the same conclusions."

INSECT POLLINATION.

Waite and Fletcher placed little value on pollination by wind. In 1893 Waite had listed fifty species of insects which visited pear flowers. He says: "The common honeybee was the most regular and important abundant visitor, and probably does more good than any other species. The

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sweat bees of the genera *Halictus* and *Andrena* are very abundant and useful. At Washington, in 1891, they far outnumbered all other insects; the same thing occurred at Rochester in 1892. The hairy coats of the bees and their brushes for carrying pollen render their visits more efficient than those of other insects in crossing the flowers. . . . Be sure that there are sufficient bees in the neighborhood or within two or three miles to properly visit the blossoms."

Fletcher says (1910 report, p. 213): "Insects are probably more important than wind for carrying pollen from tree to tree." In this bulletin (No. 181) he says, referring to insect aids in cross-pollination: "Of these the wild bees of several species are probably the most important. . . . But few, if any, wild bees can live in a large orchard, especially if it be well tilled. As cultivation increases, the number of these natural insect-aides to cross-pollination decreases; hence it may become necessary to keep domestic honeybees for this purpose."

Doctor Banks (Bureau of Entomology U. S.) recently published a list of 382 species of different insects collected by him on the blossoms of *Ceanothus* (redroot). Oregon Circular Bulletin No. 20 says: "Careful experimentation has shown that very little, if any, pollen of our tree fruits other than nut trees is transported by the wind. Probably 99 per cent or more of the transfer of pollen is done by insects. Prime among these may be mentioned the honeybee. . . . No doubt the common hive bee is by far the best of all, and it will pay every orchardist to have a few stands among his trees." The Bureau of Entomology says that the annual value of honey produced in the United States is $20,000,000, but that the services the bees render in fertilizing the blossoms of fruit trees is worth many times $20,000,000 every year.

We all agree that the blooming period is very short for apples and pears. The winds waste pollen, the rains wash it off, and drouth injures it. Authorities estimate that 6 to 10 per cent of fertilization, where the bloom is fairly good, will make a crop that, allowing for ordinary dropping, will often require thinning. The pollination period is shortened often by rains or cloudy days when the bees are not working. Apiarists give the average effective range of the honeybee at from two to four miles. They have been traced ten miles. Summing up the whole matter, the fortunes of the fruit grower rest in the work of the busy bee. We will admit they can do the most work in the shortest time if they are in the orchards. W. L. Porter, a prominent apiarist, of Caldwell, Idaho, estimates that one good hive of thrifty bees for each two acres of mature apple orchard is about the proper number for good pollination work. His observations in Colorado and Idaho prove that some of the bees work at night during good weather. Where in the orchard will you have the bees —among the trees bearing abundant pollen? Can they do better work if they do not carry their loads against the prevailing winds?

R. S. Herrick, field horticulturist (Colorado Agricultural Station), has made observations there for years on the relative blooming periods of fruits, and has experimented on the power of various varieties of apples that pollinate themselves. It is hoped his report may be soon published.

What we need in every state in the West for successful commercial fruit growing is to know the best receptive fertilizers for our leading varieties of apples, such as Winesap, Jonathan, Arkansas Black, Gano,

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Grimes Golden, Ben Davis, York Imperial, Black Twig, Missouri Pippin, etc., considering their blooming periods and the amount and size of fruit to be grown from the crosses. Such information would be worth many millions.

It is very evident that there is no profit in growing any self-fertilized apples or pears, since it means smaller fruit and less of it, nor can we depend upon the winds for pollination. The conclusions are few. We must cross-fertilize and have our own bees to carry the pollen.

Evening Session.

Called to order by President Hoover.

PRESIDENT HOOVER: We have for the opening of the program this evening Hon. John S. Dawson, attorney-general, who will give us the address of welcome.

ADDRESS OF WELCOME.

By HON. JOHN S. DAWSON, Topeka.

Mr. President, Ladies and Gentlemen: I have been told, however, since the election and the adoption of the suffrage amendment that to address an audience by beginning "Ladies and Gentlemen" is not up-to-date, and the thing now to do is to begin by saying "Fellow citizens." (Applause.)

On the theory that there is nothing done in vain, there should be found some reason for an address of welcome. It seems to be a common thing, and so in blind faith I approach this little duty, a pleasant one indeed for a public servant. We do welcome you to the capital city; we welcome you to the statehouse, the seat of government; we welcome you to this hall, to your own property. This property belongs to you, belongs to the people of Kansas; of course you are heartily and cordially welcome, and it hardly needs any greeting from one of your servants to make you feel at home.

You belong to the Horticultural Society. I suppose that you had such a comprehensive program, so filled up with learned papers and discussions concerning your work, that out of an abundance of caution and not to jam the program full you invited for the address of welcome a man who knew absolutely nothing about horticulture, because my duties and studies have been in another direction. I know nothing about the subject. I do recall enough of my schoolboy days and my studies in Latin to know that the word comes from *hortus*, a garden, and a verb, *cultum*, cultivation of a garden. I know in a general way it is the oldest vocation. It goes back to the first things; clear back to the Garden of Eden. A fine place that must have been, because we are told in Holy Writ that even the Lord himself, when He found a little leisure, would come down and walk in that garden.

Your society is one of many which is wont from time to time to gather in this hall at the seat of government, and to one who has toiled in a modest capacity around this statehouse for a good many years, as I have done, we can not help being impressed with the earnestness and

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sincerity and zeal of the members of the various societies who gather here from time to time. The State Horticultural Society, State Teachers' Association, the lawyers, gather here from time to time studying how the administration of justice may be made more simple, more effective and more efficient. The ministers come on occasion, to enthuse each other concerning their splendid work; the doctors, too; the labor societies, and the great heads and great boards of the horticultural and agricultural societies.

The gardener's position is an enviable one. The horticulturist in all the various subdivisions of his calling seems to me to be enjoying an enviable lot compared with the strife and storm that goes to make up so much of the work of many other callings. The lawyer's life is a hard life; as George R. Peck, one of Kansas' early famous lawyers, said, a lawyer is a man who works hard, lives well and dies poor; but the last, of course, never applies to the horticulturist. I say the lot of the gardener is an enviable one. It seems to me comparatively easy for him to be a good man and good citizen who is not brought right up against the strife and stress of other callings.

Under his hand the earth is made to bloom in springtime and develop the golden fruits and harvest of autumn. Cincinnatus, we are told, after being wearied with wars and politics (particularly politics), retired to his little orchard and garden, and when some of the politicians of his time urged him to return and once more enter the maelstrom of politics, he replied: "If you could see the cabbages I have grown with my own hand you would understand why I do not want to return to the field of politics." You also remember the great days of Rome, that citizenship which wrote the laws which have been the wonder and admiration of all succeeding generations. Those laws were not written at the time her legions were seen from Gallia to Arabia, but when each Roman cultivated his orchard and vineyard. You remember the brave captain Horatius, when the commonwealth came to reward him they gave him as much land as two strong oxen could plow from morn till night. I fancy that took about an acre of land. It did n't take much acreage to develop that splendid manhood and womanhood.

I admire the independence of the orchardist's calling. He has the assurance of living under his own vine and fig tree. He need worry nothing about the old-age pension system. The struggle for existence is not so great, and, best of all, he is not another man's hired hand. It is un-American for one man to work for another all the days of his life. I believe it better to be the independent proprietor of a horse and dray than to be at the beck and call of another man for a lifetime.

It is a healthful calling, perhaps the most healthful of all; it is not so strenuous. There is not so wild a debauchery of work as that which accompanies some other callings. The farmer, during the crop season, has to work so many hours disposing of a year's work in a few weeks' time. There is a morality about orcharding and gardening. Swift, I think it was, said of a gardener that he made two blades of grass grow where one grew before; and a man like Burbank, who has studied physiology of plants, drawing from the mountains and the Saharas new and rare plants,

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and has developed new kinds of edible plants. Such a man is a benefactor to the human race; and there are many Burbanks in this country, great and small. There is also a cultured individuality about it that goes back to the first things. Consider the lilies of the field, how they grow! Man becomes a philosopher, or it seems to me he should. This high-class cultivation of the soil such as is practiced by horticulturists, and as a philosopher he is bound to study the marvelous mystery of the reproductive growth of plant life. We have the fruit and grove and flower, and the fine thinkers around our banquet tables say they suggest to us the hope of immortality, which is backed up and emphasized by the changes buried in the lowly earth, and in time indeed blooming flowers; splendid ideas, all going back in their root and origin to the work of the gardener and tiller of the soil.

Men like to do good. In the course of my work as a public prosecutor, in which I have been engaged almost continuously for ten years, I have come to the conclusion that there is a great deal of good in bad men—men we put in jail and men we send to the penitentiary—even in the worst of them. We get a burglar away from his life of crime, and he may be good except that he has a disposition to burglarize. The same is true of men of violence, who may take the life or limb of another. Outside of that one weakness he may be a good fellow at heart, generous, ready to do good and ready to help. There is nothing so common as the bootlegger. He makes his money, or did make it, easily, and he spends it readily; he was generous. But it seems to me that the man who cultivates the soil, who grows fruits and flowers and vegetables and grains and grasses, is a benefactor, who brings into play his part of the world's usefulness, and he is a benefactor not only to his community, but to people far distant, far away; and how remarkable it is that one may take a journey into a far country, thousands of miles from his own home, go out by side of valley and mountain, tap a spring of water, build a dam and irrigate the ground, train up fruits and flowers and vegetables of the finest kind, supplying not only his family and household, but shipping them hundreds and thousands of miles away, feeding people in the congested centers of the world. His hands are clean and his work is clean. Thomas Jefferson did say, when he was writing on this subject, that the gardeners are God's chosen people; that their work develops the best in man, trains and nurtures the sturdy qualities. He points out the facts that corruption of the virtues of the children of the soil has never been a menance to any country; that rot begins not near the soil, but in the congested places in the great cities.

But I told you in the outset, ladies and gentlemen, that it was next to nothing that I knew about horticulture. You have gathered here for the purposes of fellowship, to get ideas for your splendid calling, for the discussion of methods whereby your work may be further advanced, for the development of greater efficiency either severally or collectively, and for conservation of the soil, conservation of the trees, plants, fruits, and so on.

I must not take any more of your time. However, I want to say I thank you for being here, and on behalf of the officials of the state I bid you welcome, and wish you good luck in all your deliberations. (Applause.)

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RESPONSE TO ADDRESS OF WELCOME.

By PRESIDENT E. G. HOOVER, Wichita.

In behalf of this society I wish to thank you, Mr. Dawson, for the kind words which you have spoken to us here. If horticulturists were to enjoy the ease and the compensation you have taken them to, it would be a very enjoyable life to live, and again, when you say that the horticulturist does not have the strenuous life of the farmer, I am sure I can depend on the rest of the audience to join in saying that he has. Show me the farmer in the state of Kansas that has as strenuous a life as any one of these fruit growers in this hall to-night. You take a real actual fruit grower, he has not a day of leisure in a year, except one or two, when he can take them to get up to this horticultural meeting. That is the limit of my holidays. Really our season ends the last day of October. That is usually the day we finish picking our fruit. Then commences our study for the coming year. We go to work pruning, pulling out dead trees, brush, etc., and probably spraying for San José scale, hauling up our winter's wood, etc. We are troubled with the gasoline men and the spray men. We have to get our materials ready; to see that we did n't leave water in the pumps last fall, etc. In order to do this we work about eighteen hours a day. That is about two hours longer than the farmer works in his strenuous time of cutting a little wheat. We do this till about the last of March, and then we go to spraying, and from that time till the 1st of July we are spraying. We commence again about that time to pick fruit. Then, about the first of September the main crop comes on, and then we commence getting ready, hustling up the boys for picking, something like sixty or seventy days. If you live some distance from town you have to feed those men. In order to do this the housewife has as much as she can do from 5 in the morning until late at night. Then we have to see that those apples are packed right. Then we say the commission men "rob" us, but they don't always rob us. No, we don't have any strenuous time, Mr. Dawson, it is a picnic.

COÖPERATION.

By PROF. C. A. DYKSTRA, Lawrence.

I am warned to say "Fellow Citizens," and so it is Fellow Citizens. I do not envy the fruit grower at all to-night. I have heard so much about him, that I pity you to-night also. It is unfortunate that the Chancellor could not come.

I am reminded, in that connection, of a story you all learned in school, if you went to school very long. I imagine some of the horticulturists did have time for that. The story was that a good many wears ago, when the Spanish were at war with the Dutch, a little Dutch lad going home one night saw a stream of water leaking through a dike and down into

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the town, and you remember how he put his fist into that hole in the dike in order that he might stop it. To-night one of that lad's descendants (the chairman has pronounced my name) is going to fill in the gap left by a very large man. You know Chancellor Strong, and you know I am not half as big as he is. Therefore, if you will bear with me I will lay my fist in that gap for a few minutes.

I bring to you all the greetings of the University. The University, of course, must be interested in the work of a society like this, as it is interested in the work of all societies of the people of Kansas. We are arrayed in the same kind of work and same kind of a fight.

For a few moments I want to call attention to one of the things that has occupied many of us nowadays. The Americans are confronted with great problems to-day. We are searching our souls; we are in a somber, threatening kind of mood. We are wondering whether, after all, this century of independence has been all it seemed. We hear on all sides cries of distress. We hear the complaints from cities, the disaffection from farms, the outcry of the horticulturist; from those interested in mining, in railroads, in crops, in transportation, the same thing. We are all wondering what is the matter. We do not believe any more that we are the only people in the world who have the elements of freedom. We are not the only people who have liberty. There was a day when we were the teachers of democracy for the world, when we thought ourselves far and away in advance of other people, but the period that De Toqueville talks about in America, from 1800 to 1830, is not what we have to-day. We are not any longer the teachers of the world. We quit giving lessons, if you please, in democracy, the thing we pretended to be adept at. We forget, perhaps, some of the ideals that we used to think a good deal about, as we always do when we are occupied with other things. I say to-day we find ourselves in this, what seems to be a Slough of Despond. We have with us prophets of evil, prophets who destroy, those who tell us we are on the road Rome trod and that it will not be long before we go the same way. I want to bring another message to-night. A message of hope, a message of inspiration. I will not say that after all we are wrong in anything fundamental, that by some searching examinations we can not find out what we are about. I simply question. Are we morally unworthy? Are we immoral? What is the matter with us? Why this spirit which occupies us to-day? Or are we just finding ourselves beginning to say we have gone a little bit wrong and this is turning on the light? It takes a little investigation to set ourselves right, and the way to find out is to go back over the way we have come to see whether we have been deflected en route, whether we have taken the wrong path.

How were Americans made? What entered into the making of an American? Of what peculiar stuff are we that we should have been a separate people? We know the history of the early comers to our country. We know the struggles through which they had to go. It meant cultivation of a spirit of independence that meant loyalty to one's own interest, to one's own motive. We know what it meant to face bands of savages in those New England woods, to face long, hard winters with

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but small supply of fuel and food. We can not wonder that conditions of settlement in the American colonies should have bred in us a very different type of man than we ever knew before—a confident and self-reliant man, courageous, bold, ready to take care of himself, and always able to do so. That man came to a continent as rich in resources as any other known. All he needed he could find ready at hand. There was nothing he could turn his hand to that would not immediately become wealth. It was natural that he should think in terms of large things. The conditions under which he left his old home, together with the peculiar type of settler the man was, made a peculiar being here. Here he found the economic freedom he craved, developing that freedom until he could no longer find an outlet for it.

When no longer the American could be restrained by the bounds England threw around him, the various economic restrictions upon American merchants and traders, then it was the American demanded the economic freedom which had been bred in him; and so the American Revolution is but a step in the making of that American. To such a people then came the opportunity to make a government. What sort of a government should they make? A government, no doubt, in which they should have free rein, in which the legal restriction was small, in which the individual element was large, in which the individual saw himself in his true proportions—a government which recognized every right that the individual craved. He wanted a government under which the individual might have all the economic freedom which he could manage for himself, all the opportunity that he craved, and hence we have, coming before the American Revolution and those days just afterward, a philosophy—a philosophy of men who wanted to be let alone by the government. Jefferson stands as their philosopher. It was n't a new philosophy, of course, but he stands as the philosopher of the idea that under government man must have what he wants without government interference; man must be a free agent, and a free agent economically also. And this philosophy of Jefferson's looks at the government as an awful thing, something to be kept as far away as possible. You remember his saying, "Far rather would I have newspapers without government than a government without newspapers." In other words, he was willing that the government should be shriveled and shrunken to the least possible proportions. That was the best government which was the least government. Let us have as little as possible, then, of this tyranny; for the government was to stand far off while the citizens helped themselves to all the resources of nature. They helped themselves sometimes, perhaps, to the government till. And this philosophy became crystallized in the early years of the nineteenth century into all our leading institutions, and we urged, firmly believed, that the less government we had the better it was for us. Then we vied with each other in all that we wanted—whether it was mines, trees, lands, acres, it mattered not. There sprang up under that American spirit a violent competition in all the resources of the continent. What did that mean? It meant a tremendous western movement, which settled the country in an incredibly short time. The short space of a hundred years saw a thousand miles of broad acres developed after a fashion. This spread of the people over the continent was attended, no doubt, by some of the

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things none of us would wish to see repeated. To conquer a continent is not an easy thing. To conquer wisely is less easy still. To conquer it the way be conquered it was a travesty. It mattered very little what happened to the succeeding generations; it mattered very little to those who were crossing the continent if the desire to get from the government and our neighbor was but satisfied.

Therefore, the temper of the American people of the early nineteenth century, plus the old idea as it was given us by Jefferson, put a merciless individualism into our American society—an individualism which we have been as yet unable to shake off. What did that mean? It meant the wasting of the public's wealth, wasting of the goods of the American people, the disregard of all public rights, the rights of those who were to come after; in short, of all save only our private rights. The struggle was among us all for whatever advantage the government might see fit to give us. So we all entered the claim on the government grounds for broad acres and for water sites and for forests and for mines; the government was entitled to no consideration; we only were to be concerned. The fact of the matter is, the government not only was not entitled to consideration, but it was to be the fruit which we were to pluck. It was your legitimate advantage and my legitimate advantage if we could beat the government at any game at all. The government must look out for itself, and those who protected the wealth of the government were legitimate prey. Here an individual takes over a vast tract of land, and then allows the city to make that worth something, meantime demanding from the city a great many things that the man who has to pay the taxes can not pay. It is the big individual unworthily developed out of our own American life, naturally enough, whom we have yet been unable to get away from.

I say the trouble is that individualism has led us into something of the state we have found ourselves. We did not wake up soon enough. We did not see that what we were developing over here was this violent and fierce competition between individuals. When we ourselves were betting and failed, when we gambled for big stakes and lost, we discovered that we needed somebody on our side to care for us, since we were not over-able to care for ourselves. I say that this is what we, as Americans, have developed—a supersensitive, overconfident individualism—and it has played us false. I have tried to put, in somewhat short space of time, a condition which confronts us and out of which we are now striving to get ourselves. I hope you will not think I am making a political speech. It seems to me there are some of us who realize that there is something wrong. Is it our theory that is wrong? Is it our belief in democracy that is wrong? Is it our law? Is it our morals? Is it our business?

The fact is that we are asking for scientific investigation into every phase of our individual development. You are here, other societies are meeting, to see if by unity of action we can not overcome some of the difficulties. One of the hopeful signs of the time is that we have innumerable societies, men who are coming together at their own individual call, if you please, to do by coöperation what we have been unable to do by our individual initiative. We are doing that in all walks of life. We are asking as societies for the aid of scientific bureaus of one kind and

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another. We are asking that all information shall come directly to us. We are asking for professional bacteriologists and entomologists to come and work with us in order that we may understand some of the things we never could have understood by ourselves; and that, of course, shows itself best and largest in the tremendous movement which is sweeping this country over at the present time. Realizing, if you please, that we, as individualists, can no longer survive continuously the course on which we have started, one which would not only ruin our posterity but our country, we come together in some kind of policy which will conserve for us, for a generation of 200 million, 500 million, the resources which we have so wantonly thrown aside. There was a day when we mined the coal, 10, 15, 20 per cent out of the mines and left the rest there. Therefore, we must get the cream all over, everywhere. There was a day when we cut down great forests in order to find three or four good trees, or a dozen. There was a time when we monopolized water power in the same way, when we got as much of the public land as possible. The particulars of conservation are well known to all of you. The proposed conservation works out into another field, not only conservation of our resources, not only conservation of ourselves as individuals, but conservation of society, conservation of opportunity. We are bound, under this kind of spirit, to provide for all an equality of opportunity. Not an equality of goods, but an equality of opportunity, so that the individual may receive from a coöperative society, all of us, what each one deserves at the hands of the society.

So the present day calls to us for a surrender of principle which we have, perhaps, always held very dear. It is that principle of absolute individualism. It is that principle of freedom in our concerns which we ought to look at differently if we are going to get anywhere in the new century. It is possible there is something wrong with that fundamental doctrine, that adage which comes to us from the Scriptures, that we are our brother's keepers; that some things we can not do alone but together we can do. In 1861 a million men gave up their freedom for four years. To-day the call comes for us to give up our freedom, if the hope of America is to be fulfilled; if we are to maintain what we always thought we were, the land of the free and the home of the brave. We find ourselves falling behind in the race. We find the Germans and English doing much more for all their people than we ourselves are doing. Some way our pupils learned from us early and then went way ahead of us. We will have to sit at the feet of some of the European governments to rehabilitate ourselves.

To be fair to ourselves, to be fair to the future, to be fair to our race, we must coöperate with each other in order to save the best we have for those who are to come. That, I take it, is the spirit entirely of a society of this kind. We must cease haggling for our own private advantage and think in terms for each other. All scientific societies are helping, as are our schools, in this conservation of human opportunity. What we need is to know exactly where we are and why we are here, to reëxamine, to find out after all if we have not gone just a little astray. I think we will find that we have insisted on private right as over against the right of

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the state, which is the right of all, and we have insisted that the state enforce that right for us. When we recognize our duty as American citizens at the present time I am sure we will enter upon this spirit of coöperation with new zeal and new enthusiasm, as we have entered for a great many years on an enterprise like this one. (Applause.)

PRESIDENT HOOVER: We have with us to-night the president of the American Pomological Society, Mr. L. A. Goodman, of Missouri, who will now address us.

MR. GOODMAN: *Mr. President:* Many years have I been a member of the Kansas State Horticultural Society, and I want to pay a word of tribute to my old friend, Judge Wellhouse. It seems hardly possible to be the Kansas State Horticultural Society without his presence. He has been a dear friend of mine during many years.

I bring you a message of greeting from the American Pomological Society, which embraces all the pomological societies of the United States. Pomology is only a part of horticulture, I am reminded from the words of Attorney-general Dawson about the horticulturists. I think he knows what a horticulturist is; I don't know that he knows what horticulture is. I wonder whether he really thought it was something like a friend of a daughter of mine trying to find out what her father was doing. She got hold of a letter in which my address on the back of the letter was "Missouri State Horticultural Society, L. A. Goodman, secretary." She said, "Well, I know now what your father is doing; he raises horses."

ADAPTABILITY.

By L. A. GOODMAN, Kansas City, Mo.

In Maeterlinck's play, "The Bluebird," he gives us a glimpse of what the future inhabitants of the earth think of pomology. As many of you know who have read this imaginative, suggestive book, he makes the unborn spirits of all time to come, live in rooms of sapphire blue; the baby souls are busy at the various trades, professions and inventions which they are destined to carry to earth. Some shrink from the evil, disease or failure which they are to bring; some are quiet, meditating and dreaming; some are happy, knowing they are to bring joy and help to others. Among these are the wizard fruit growers, who have gorgeous flowers, huge melons, and wonderful pears. These are ready and eager for Father Time to let them through the gate and sail to earth. Horticulturists should ever be thus, happy to give, sharing their knowledge and improving the fruits of the earth.

Orcharding means more to-day than it ever did in the past years, as to extent, varieties, location, and marketing. We have found many things essential: 1. Climate. 2. Location, close to transportation. 3. Character of soil and subsoil. 4. Elevation above surrounding land. 5. Adaptability of varieties to climate, soil and markets. 6. Proper preparation of the soil, and correct shaping and planting of the trees. 7. Cultivation, care, pruning, for the first five years. 8. Care and attention after. 9. Spraying. 10. Gathering, packing, marketing, and keeping.

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Climate, subsoil, adaptability, the tripoid of fundamentals; cultivation, pruning, spraying, the tripod of work; varieties, care, markets, the tripod of study. These are the prerequisites of success.

Apple-orcharding has indeed become a great business, an enterprise, an industry, a profession in and by itself. We are especially conscious of this when we consider commercial apple-growing, which is only another name for profitable apple-growing.

There are other requirements, of a psychological nature, just as essential for successful orcharding. Chief and basic is a love for the work. A creative joy without which any work becomes drudgery. Love for trees and tree-growth makes every step a pleasure, a recreation, a labor of love instead of a burden of labor. When we plant or prune or cultivate we should do it with a love for the trees, wondering what the results will be.

"Canst thou prophesy, little tree,
What the glories of thy boughs shall be!"

Every step in the whole life of the orchard is taken, to be sure, with a view to the production of fruit, and that in paying quantities. We see in the young trees we plant to-day an ideal, a vigorous young orchard, a strong bearing orchard, a fruitful old orchard.

Enthusiasm is another necessity. We allow no one to talk more, discuss more, study and work more assiduously than we do in our orchard work. I think we all admire people who are enthusiastic in their calling, and the orchardist needs this qualification even more than most other professionals. Intelligence of a high order is most essential—not only wit enough to know what to do and when, but intelligence to see what the results will be before it is too late; to draw correct conclusions, and so build up a scientific, accurate working plan. There is no line of business that requires a greater amount of intelligence than does this profitable orcharding. Knowledge, wisdom, experience, are prime requisites of the same order. We should know what a certain treatment will produce without waiting to experiment; should see what trees need before they speak too loudly, knowing that if you neglect a tree it will suffer; if you abuse it, the tree will resent it; if you fail to provide water or food, the tree will refuse to give you profitable returns. Knowledge has to cover the character of the soil, nature of the tree, effects of the weather, congeniality of tree to land, adaptability of soil and subsoil, choice of varieties, location, elevation, judgment of markets, all these give us an idea of how great a factor knowledge is, therefore in all our getting let us get knowledge.

Business methods are as important in this work as in mercantile, manufacturing, or financial callings. We should not lose sight for one moment of the constant need of thorough business management in every part of this work. With more definite business sense and habits, with organization and system in every part we shall hear less complaining of unprofitable orcharding.

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SOIL ADAPTED TO FRUIT.

The climate being suitable, successful orcharding depends, more than on any other item, on the subsoil. We can make the soil, if it is not rich enough, but we can not change the subsoil without very large expense. There are thousands of acres of good land scattered over our country with the proper subsoil for orchard, but right among these lands are other thousands of acres just as valuable, but for other purposes, and by no means suited for orcharding; orchards on these tracts would surely fail. In locating your apple orchard adaptability, the proper congenial subsoil yields success, improper subsoil naught but failure. There are too axioms which should be burned upon the memory of every fruit grower. Test your subsoil; examine it; dig down under your soil, not in one place, but in a hundred different spots; see what is below your land and find if it is adapted to apple trees. A few dollars spent in this way may save thousands later.

The best soil and subsoil in our western country, or in the world, is the "loess" formation. This allows the rain to sink deep, and holds the moisture until it is called for by the droughts of summer or the cold of winter, and never gives trees "wet feet." It is fertile, also; and it is this fertile, porous subsoil that is to be desired above all others.

Gravel or clay shales are next in value, and found in many of our apple districts. A red clay shale with porous limestone subsoil is also valuable. In our mountain districts we find this mixed with iron, which gives extra color to the skin, and quality to the fruit. Above all things then, select a good, fertile, porous, well adapted subsoil, and if you have it not, go where it is, as per the advice of a railroad president who sent a delegation of settlers over his line to find what they wanted, but told them if they could not find it on his line, to hunt it up, and he would build a road to it, where they could get what they wanted.

After the subsoil comes the adapted soil. Not so important, and yet a considerable item if you wish the best with the most economy. A good fertile soil, porous, loamy, with plenty of humus, potash, lime, and iron, such as to give a good crop of grain or grass, is the first choice. The nearest approach to these provisions is the aim. A soil that dries off quickly so that it can be plowed soon after rain, one that works easily, will give the largest returns with the least time and labor. A soil that gives a good crop of corn while we are growing the trees, one that will not bake easily, is always desirable. Next comes the rocky or gravelly soil, which is often good, the only drawback being that it takes more work to get satisfying results. These soils, found in abundance in our mountain districts and river hills, are nearly all good fruit soils.

Adaptability of location and exposure are also features to be well considered. Elevation above surrounding land, high land, so that we get good air drainage, is a point that brings us close to the line between success and failure. Elevation above the sea as we go south of 40 degrees is important because we get into colder, drier, purer air as we go higher, hence we find apple orchards extending quite far south in the mountain districts. Height above sea level is not enough; we must have, also, elevation above the neighboring land; lack of this gives us trouble with cold air, for on top of a broad tableland on the mountain the frosts

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are as bad as on the lower land. The northern slopes and exposures are considered best, and I think wisely so, because I find the best soil and subsoil on this side; not because of the location itself, but because of the exposures; whereas on the south slope the hot sun burns out the soil. While I find that in some seasons other slopes give us the most and best fruit, yet this rule is a good one, but only because lands on the north slopes are usually better.

In my boyhood home near Detroit, Mich., my mother taught me horticulture, and a true horticulturist and excellent teacher she was. From her I learned to bud and graft, plant and transplant trees, to care for fruits, for the garden and for ornamentals. There on the bend of a stream close to Lake St. Clair, we grew apples and sold them by the boatload to Canadian neighbors. A custom for planting our seedling nursery is one it would be well for us to practice at this time. As children about the fireplace, when eating any perfect specimens of Spitzenberg, Vandevere, Steele's Red, or Newtown Pippin, we were expected to save the seeds, and the best of them, carefully sorted by hand, were kept for spring planting. The seedlings were grown for three or four years in the trying climate of Michigan, and those that withstood the rigorous winters were topgrafted or budded from special individual trees which were known to have yielded the best fruit and most of it for a number of years; these were grown one or two, or possibly three years, before planting in the orchard. Is it then any wonder that our orchards did well in the virgin soil with such character of trees to plant?

ADAPTABILITY OF TREE TO ROOT AND ROOT TO SCION.

First, the roots we use for grafting are not taken from the best of seedling apples, or from varieties of known hardiness, vigor and productiveness. Seeds are often taken indiscriminately from all kinds of fruit, often from imperfect, immature fruits, are they not? We should have good seed from healthy fruits of fine quality, from vigorous, prolific trees, or better still from healthy, hardy seedling trees, and the roots grown from such seeds carefully selected for health and vigor. This would be a step in the right direction, would it not? A much needed improvement surely.

Then the scions; how much care do we exercise in their selection? Are we not careless in cutting them? Do we select healthy trees, hardy, productive, bearing regularly the best-colored fruits of best size and quality? Do we select from individual trees, keeping these facts in mind? If not then we have been propagating our trees to decay. We have not practiced the most efficient methods. Individuality of trees is a character long lost sight of, and to our shame and loss be it said, for it is an intellectual as well as financial loss to fail to use the facts of nature to our advantage. We have all noticed this individuality, yet have failed until lately to utilize the fact. Certain trees are of a higher standard of value in all these particulars; it may be because of more congenial environment or nobler parentage, but whatever the reason we should use this individuality, should perpetuate and improve it by careful selection. I am sure that if all the trees had been thus carefully, intelli-

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gently selected, our orchards would be double their present value. Adapt this individuality of tree to your future planting.

As for digging, handling and planting, few consider these points sufficiently, no matter how much they know about them. Most of our planters are too negligent when they come to this part of the work. They forget that trees are alive and need to be treated as living things. They forget that trees can be kept alive only by having their roots in the ground, or in about the same condition as if in the ground. Trees begin to die as soon as they are out of the earth, the only question being how long before they wither beyond resuscitation. If trees are taken up properly, with plenty of root, handled carefully, not bruising the bark on tops or roots, protected well, never exposed to sun, wind, heat or cold, and correctly planted, you will not lose over one per cent of them.

Adaptability of varieties is of vital concern. Without this, other qualifications are in vain. It would be impossible to give specific directions for each and every location, soil, or elevation for varieties adapted to each.

It is the experience of every strawberry grower that certain varieties do their best in a peculiar soil, or subsoil, location or elevation, and for certain markets, while in others they fail. As examples I remember special places where the Aroma, Gandy, Tompkins, Texas, and Excelsior do their respective best, and other points where they do not pay at all. This because of a failure to study the adaptibility of varieties to soil, climate, market, etc. Still more failures come from not knowing the adaptability of other small fruits, or peaches, or pears, or apples to money-making. You know places where certain of the fruits will not pay. You know locations where the same are a decided success. You know many places where the quince fails. There are choice locations for the success of the peach, and it pays to search and find them if we mean to grow for profit. Every one of us can tell where pears are not adapted for profitable growing, in fact one could cite scarcely a locality where there is any large profit in pears in this Central West.

A man once wrote me asking for a list of the varieties of pears most subject to blight as he believed he had a location blight-proof. I sent him a list of those least prone to the disease, and suggested that he would see enough blight anyway to satisfy his curiosity, if not to prove his faith in the immunity of his place.

Of other cultivated fruits you have only to call to mind the grape in this country to convince yourself of this important feature in all our fruit growing; how in some parts of our land the Catawba is the money-maker, in others the Concord, in others Moore's Early, or in others the Niagara. Not that these are the only ones, perhaps, but that they are the money-makers in their respective localities, because of their peculiar adaptability to climate, soil and markets.

Nature does not make blunders in plant life as you well know. Trees, shrubs, vines, plants grow well on one hillside or valley, when you find none of the same kind on the opposite hill or next valley. Adaptability nature demands in strict bounds. Pine trees, oaks, cedars, elm, sugar maple, tulip, magnolia, hundreds of others nature adapts to narrow limits.

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Why should we not listen to this call of the wild, and try to build upon this reasonable demand of adaptability?

Varietal adaptability among apple trees is a problem worth the closest experiment and observation of every fruit grower. Unless varieties are adapted to climate, soil and subsoil, to location, exposure and markets, unless they are properly productive and hardy, we plant in vain; results are disappointing. This study of adaptability is one in which we can reach conclusions only by actual experience. Many sad blunders have been made by reasoning or supposing when experiment should have been the only guide. It is well also to make the experience of others serve as our own. Do not stop to experiment where others have already done so, but take these conclusions and profit by them. Certain varieties are now known to be best in special localities, as the Newtown Pippin in Virginia, Fameuse in Canada, Gravenstein in Nova Scotia, Baldwin in New York, Rhode Island Greening in Michigan, Jonathan in Missouri, and Spitzenberg in the northwest.

You and I have noted that certain varieties do especially well in one location and fail in another; that one is adapted to this climate and is not to some different one; that one will withstand spring frosts when others are easily killed; that this variety will pay on one kind of soil or subsoil and is of no value on another; that a chosen variety is hardy and prolific here, yet an entire failure in some other district; that some select variety is of excellent quality and tree vigorous in a special location, but poor and weak in some other. Moreover, you have all had experience with and occasion to notice the fact of peculiar adaptation of certain varieties to some of our best fruit soils, how if any apples pay at all, these certain varieties are always the ones; so you and I have settled on the fact that Maiden Blush, Wealthy, Grimes, Jonathan, York, Winesap (or Stayman), Ben Davis, Gano, and Ingram are well suited to most of our good fruit soils, though not to all in the same manner or degree.

In keeping the important feature of adaptability always in mind, observe also the opposite or negative side. For instance, do not plant Ben Davis in the North, any more than we of the South should plant Rhode Island Greening. Use only those varieties known in a commercial way. Beware of new varieties with grand names, old varieties under new names, varieties named only to sell. If you hear of some new varieties doing well, try them sparingly; to try varieties far removed in fitness from your location and conditions is a foolish experiment. Varieties which claim to be best for everybody, everywhere, in all places and all the time, are impossible. Varieties must be intelligently chosen with regard to climatic, soil and distributing possibilities, or our orchards will fail. Careful attention to all the experience we can learn from similar situations, eyes open, ears ready to hear, judgment to draw accurate conclusions, will be our safe guides. Yet always we must do our very best in every step of the work. As President Lowell said to a rich but delinquent Harvard student, "A gentleman's grade is the best that he can do."

The accurate and diligent application of our intellect to the work is the scientific and satisfactory way. In studying this adaptability of varieties we often think that if a variety originates in a certain locality

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then it must be well fitted to that, but such is not always the case. While most of our varieties are chance seedlings, yet we often find them doing their best far from their place of origin.

While little has been done in the way of breeding or crossing apples, with satisfactory results, yet the time is near when breeding, crossing and selection will be three absolutely necessary steps in the scientific improvement of our fruits. Some steps have been taken, and others will be, along this channel, and ere long we can have a family pedigree of fruit varieties as we have with cattle, hogs and sheep.

At the Missouri Experiment Station at Mountain Grove, Director Paul Evans has some 700 new apples, all of known parentage. Among them are some 40 or 50 that resemble their parent closely enough to be named the Jonathan family, for the male parent was Jonathan, the female being Ben Davis. This is the largest and in every way much the finest collection of new apples of known parentage ever brought together. It would not, however, be safe to say that because they all originated in the Ozark region they will therefore all be adapted to grow in the Ozarks. But if we shall find one or two or three of these suited to as wide a range as Ben Davis, but of better quality, and as perfectly at home as Ben Davis is in that region, we shall have a step toward the more perfect variety.

If the crossing and breeding of these seedlings could be continued for several generations, I am sure that we should have not only a Jonathan family, but undoubtedly could breed a number of varieties which would be wonderfully well adapted to the Ozark soils and climate, the ideal apple for that location. The ideal apple is one which is peculiarly fitted to a certain soil, will bear handling well, has natural keeping qualities, good color and size, is hardy, vigorous and productive, of good quality, resistant to fungous diseases and insect injury, which will supply the wants of the general public and likewise of the most fastidious customer. The ideal apple can be gained only by the peculiar adaptation of the variety to the soil, climate, etc., which will make it perfect itself in every way. And yet this ideal apple might and probably would be a failure in many other parts of our land, even if planted on the best of fruit soils.

United States Pomologist, G. B. Brackett, has this to say on this topic of adaptability: "There is perhaps no subject of more vital importance to the fruit grower who contemplates planting an orchard than the question of adptability of varieties to soils and climatic conditions. Mistakes in the selection of varieties which so often occur are not only costly but pathetic. One error in this line may cause a lifetime of failure in fruit growing. The Ben Davis succeeds over the widest area of any given variety. Rome Beauty is especially suited to sandy soils. One of the main objects of the American Pomological Society in its inception was the investigation of the soil and climatic conditions in relation to the variety of fruits."

Professor Gould says, "The adaptability of varieties to the various conditions is under the following groups: climate, soil, culture. The climatic conditions include atmospheric temperature, rainfall, frosts, extremes of heat and cold, wind, air-drainage, sunshine, humidity, clearness, and electricity. Under soil we consider the character, moisture and food

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supply. Cultural conditions are largely artificial, but are what make the tree or fruit, and are therefore potential factors in determining the adaptability. The adaptability and modification of fruits are therefore subject to various and fundamental conditions, and it is necessary to know all the influences at work. Some of these have been touched upon, but many others not mentioned, although they are also essential to the complete understanding and settlement of this all-important question of adaptability."

By persistence and energy we bring about rapid improvement and advancement. The horticulture of this land is fast coming to the front. The East is adopting many of the improved methods and ideas of the middle and far West, while the West uses the best ideas of the East. We are pushing the insect far, studying and applying sprays against insects and diseases.

Our scientific men are practical, and not, as some think, buried in their laboratories with their theories. Our growers are students of science, experimenters as well as practical workers. The movement for agricultural education is growing, increasing in popularity, and the colleges and stations are spreading their information and their influence all over our land.

Because of our distances from markets, our extensive plantings, our peculiar conditions, we have had to study the questions of storage and distribution, each locality for itself, and the methods are still to be perfected. New districts are opening up, producing as well as consuming. The Northwest will support a vast population that will need fruit and will grow it.

The Pacific slope is now producing large quantities for the consumers of the East. Not one-half of the lands now in farms is improved, not one-fifth of the land area of the West is yet producing. "The farms now existing," says Secretary Wilson, "could be made to produce enough to feed many times the country's population, were the best and most intensive agricultural methods of European countries applied, and still we should have enough for export."

Fifty years after the discovery of America, and sixty-five before the landing at Jamestown, the first white man, a Spaniard, reached the Missouri river. The development of this whole Central West has progressed since then, the result of natural advantages, the physical and geological conditions, the adaptability and the climate, but also of man and his labor. Our success is due to three natural causes, adaptability, subsoil and climate; and to two human causes, men and work. This horticultural development began in 1735, and seventy years ago reached as far west as Kansas City, and to-day has reached beyond the Pacific coast to the Hawaiian and Phillipine Islands, to a remarkable degree. What we need then is men! Men capable of reading aright the demands and the opportunities now presented to us. Men to study adaptability. Our efforts should be united in study and work in recognition of the human brotherhood on our planet, of the common needs, capacity and aim of man. We must join forces, every state with every other, every nation with every other nation, every one of us with each neighbor, all for the subduing of this star-world, that the best of life may be shared

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by each and all. There are many of us on this speck of a planet, but there are millions yet lacking their fair share of its products, its beauty, its joy.

If we study adaptability, there is no limit to progress, and we believe the fruits of the earth are to become, by the help of man's thought and handiwork, more and more perfect; the march of science is ever forward, and it is our duty to keep pace with it.

"We owe some of our fruits to the trifling and innumerable exertions of a legion of small seekers, all more or less narrow, all more or less ridiculous. It is thus man acquires all his riches. There is nothing that is puerile in nature, and he who becomes impassioned of a flower, a blade of grass, a butterfly, a wing, a nest, a shell, wraps his passion around a small thing that always contains a great truth. To succeed in modifying the appearance of a flower, a fruit, is insignificant in itself if you will, but reflect upon it for however short a while and it becomes gigantic."

The lot of the horticulturist? I do not know of a very rich man among them, but I do know a great many contented, happy, moral, delightful and hopeful people among them. The prayer "Give me neither riches nor poverty" has been truly fulfilled for the fruit grower. I believe we can all say that we have had more of pleasure than sadness, more of success than failure; we have enjoyed more our associating together, enjoyed our business better, and had more good things to eat than any people on earth; consequently we are the happiest, even if we sometimes fail to get a crop and have to economize.

Nature, as we live close to it, always has something new to tell us, something of interest and benefit for us. Failure of our crop is no failure of nature. Is it not just as much nature's work to take care of the insects and fungi, as to help us grow good fruit? Nature is always busy taking care of her own. When insects or fungi become too self-assertive, nature steps in with some other fungus or insect parasite and sets the balance of life even once more. Nature gains whoever she loses. The only thing for us is to do our best, give full measure of mind and strength, and the reward of crop, of money, health, delight, and moral profit will come all in one, the result of toiling with industry and with love.

PRESIDENT HOOVER: Professor Dykstra and Professor Goodman, I want to thank you on behalf of the society, and want you to feel that the society is deeply indebted to you for your entertainment this evening.

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SECOND DAY—Morning Session.

Prayer by Rev. W. I. Cole.

REPORT OF PRESIDENT.

By E. G. Hoover, Wichita.

I can not say that I have a great deal to report as president of this society. It seems to me that we are improving in the line of getting younger people into the society in a small way, but it does not seem that we are getting along as rapidly as we might in this way. It looks to me like these older members should put more effort into the matter of getting younger people interested in this line of work and bringing them up here. It seems to me that the older men come here without ever thinking of bringing young men with them. It seems to me that it is a line of duty that each member of this society should endeavor to interest some younger men in this line of work, and if each and every one will do that, improvement will soon become apparent in this society. It should increase by leaps and bounds in the next few years to come, because if we do not take advantage of the present time to get our orchards and other fruits, vineyards, etc., in shape, the next five years will see us entirely swamped as a horticultural society by states that do grow fruit by up-to-date and scientific methods. We have got to get everything there is in it out, in order to hold our own. Now let every one, at the next meeting, make up his mind to come with at least one young man with him; some one who is interested in a small way, and get him interested in a large way.

Another thing is the difference in appearance of members this year and last. I think their faces are about three inches shorter than the same faces last year. You remember the motion Mr. Dixon made to squelch the reports of the different trustees; that they were so pessimistic that he thought they should not go into the biennial report. I have heard no such motions this year. I think it augurs well for the good of this society. If we just bear in mind that one year does n't make or break this society, we will all need to wear short faces instead of long ones.

REPORT OF VICE PRESIDENT.

By J. T. Tredway, La Harpe.

I have not prepared a written report. My experience of this year in the little circle of our community, in the work that has been given us in the press, through this society, the Agricultural College and the reports of our trustees, I am bound to report some progress in horticulture. Last spring over the state to a greater or less extent we were, I was going to say cursed, with the caterpillar. I believe I will say blessed,

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rather. I believe it was a real blessing that the caterpillar came in such great numbers to our state last spring, from the fact that in our county especially very many people went forth and bought spraying machines who probably would not have done so had it not been for the fact that the caterpillar was defoliating their trees. We all called it, in the beginning, the cankerworm; but the caterpillar was the enemy who defoliated our trees, robbing the trees in some instances, I believe, of their very life, and every place where spraying was done it did the work. Many people bought their sprayers and they did n't get them shipped in time, and we who had hand sprayers were employed to assist in spraying trees, and thus another year I feel very sure further advancement will be made in spraying our trees. And so I say, I believe it was rather a blessing that those caterpillars came. Some say they will not reappear. I don't care whether they will or not; my experience in spraying is that they were easily destroyed.

We should coöperate. I have learned very much already from this meeting, those things pertaining to horticulture, and we can send out these reports of this work over our state, and it will manifestly be of great good.

I think the professor spoke of coöperation. We should coöperate and we should organize as county societies, as neighborhood societies, and I believe we will never get good results until we do. The College has done very much advancing our interest in that form, but it has been incidental, so I hope to see the time come when we may be organized in such a way that we can help each other. Last summer apples were all prices, according to the locality. One of our neighbors shipped a carload to Oklahoma. I presume he heard of a market down there, and he received $1200 for his car of apples. His transportation charges were $300, but he never made another shipment. He sold his fall and winter apples for a cheaper price than those he shipped to Oklahoma. If we had been organized we might have found a good market. I have a son living in Leavenworth county who told me he was buying Jonathan apples for 30 cents. He was paying 40 cents for Mammoth Black Twig and 30 for Jenitons; for Winesaps he paid 40 cents. I was up there two or three weeks ago and I saw those apples. They were superior to anything we had in our county this year. I presume ours should have been thinned. Some say it was due to drouth. Our trees were sprayed, yet more or less of our trees were attacked with caterpillars before we got to spraying, but nevertheless, the apples in Leavenworth were cheaper than with us and were superior to ours this year. While up there, I saw some most beautiful apples in a grocery, and I said let's go in and price those apples. I went in and asked him the price, he replied 40 cents a bushel. That was the retail price from the grocery. Now, if we could only instill in the minds of the people that coöperation or organization meant that we might find a market more readily for our fruits, it would be very much better.

Last spring, I am very sure, in our county there was a much heavier selling of fruit than heretofore—apples, pears, peaches, plums—not in a general way, but in a small way; we have no large orchards with us. As a rule, the supply is good.

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Another matter was the report of President Hoover that we should instill younger blood, younger members, in this society. The time is coming when we older members will not be here. I believe it is the duty of each delegate to bring at least one young man with him, or young woman, if you please, next year to our state meeting, in order that we may infuse new blood, fresh blood, young blood, into our work.

A MEMBER: I suggest that we get these young fellows into our home societies. We have just elected a secretary for the thirtieth time in our home society.

B. F. SMITH: I brought a young man with me from Lawrence this year.

SECRETARY'S REPORT.

By WALTER WELLHOUSE, Topeka.

The fruit crop of our state was larger this year than for several seasons, with the exception of blackberries. The yield of blackberries was lessened by damage from the severe freeze in January principally. A very few correspondents reported a short crop because of dry weather. Very little damage to blossoms by late spring frosts was reported.

One peculiarity of the season was the size of the peach crop after the low temperature of January. It has been said, and generally accepted by fruit growers, that 14 degrees below zero would kill all fruit buds on peach trees. As a matter of fact, all fruit buds were destroyed a few years ago when the mercury went no lower than 4 below. This season, with a minimum temperature of from 19 to 27 below, 50 per cent of a crop was grown. Eight correspondents reporting from Linn and Miami counties showed there were no peaches grown in their territory where the thermometer reached a minimum of 19 below. One correspondent reporting from Osborne and one from Rooks county each had a full crop where there had been a January temperature of 25 or more below. This seems to indicate plainly that the condition of the buds during the dormant season has much to do with preserving vitality under adverse temperature conditions. The largest survival this season was in the dry counties.

The June fruit crop report from this office was as follows, as compared with the June reports for 1910 and 1911:

	June, 1912.	June, 1911.	June, 1910.
Apples	71	33	57
Pears	66	27	31
Peaches	53	10	50
Plums	60	36	51
Cherries	70	63	21
Grapes	73	69	60
Strawberries	68	37	40
Raspberries	54	46	39
Blackberries	46	54	51

The September report showed an increase of 7 per cent in the conditions of pears, while apples had decreased 6 per cent and peaches 3 per cent. The first and second districts made the best showing in apples, 79

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per cent each. The eighth district led in pears, 72 per cent, and in peaches, 84 per cent; the second district in plums, 70 per cent; the first district in cherries, 90 per cent, and in grapes, 79 per cent, also in strawberries and raspberries; and the third district in blackberries.

This season, with its large fruit crop, has very clearly demonstrated that improved methods of marketing are very much needed. In instances that came under our observation it cost two dollars per bushel or more to get apples from the orchard to the consumer. A practical coöperative organization of not only the growers, but of the consumers as well, seems eminently desirable. The low prices paid the grower and the high charges made to the consumer prevent much fruit from being marketed which should reach those who can not afford to pay the high prices now prevailing. Good apples, in some instances, decayed in the orchards while many people are now without fruit who should have it.

Copy for our biennial report, volume 31, was filed with the state printer in February, but, owing to the great amount of work at the state printing plant, the books were not all delivered until the last of October. The law allows 5000 copies, but the printing committee plead shortage of appropriated funds and cut the number to 4000. Nearly 1500 copies yet remain in our office, because of the lack of postage, which should be in the hands of interested fruit growers. We need a larger appropriation for postage.

Very nearly the usual routine has occupied the time of your office force. Corresponding with citizens of our state on horticultural matters; answering queries personally and by mail; revising list of fruit growers; indexing horticultural information; gathering and compiling statistics; editing, copying and arranging papers for the biennial report; acting as secretary of the Entomological Commission; attending horticultural meetings, and visiting fairs and orchards throughout the state, have, with other details, taken up the time of your secretary and stenographer.

The most creditable fruit exhibit seen was made in the Auditorium at Wichita during the first week in October. The apple exhibit of our worthy president consisted of over two hundred bushels in thirty-three varieties. Other members of our society had very worthy exhibits. Most of the county fairs are held too early in the season to show our winter apples in their best condition.

L. W. Yaggy, a life member of our society, died at Watkins Glen, N. Y., October 18, 1912. Mr. Yaggy and his sons have done much to assist in making Reno the leading county in the number of apple trees.

DOCTOR BOHRER: When the matter of appropriations is made mention of, I wish to call attention to one matter. I agree with the secretary that the appropriation should be greater than it is, not only for the purpose of sending out literature, but there ought to be an appropriation large enough, and the trustee of each district in this state should be required to hold at least one local meeting. The legislature should furnish the money and pay him his per diem and mileage to do that. There is work that it would take me an hour or two to describe to you that ought to be done in this state, and until we go to work and enforce it in some such way

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you are not going to do this work. I have been attending these meetings for the last forty years. I drove a mule a hundred miles to one meeting. I have traveled more miles trying to advance the horticultural interests of my part of the state than any other man.

REPORT OF TREASURER.

By O. F. WHITNEY, Topeka.

1911.		
Dec. 7, Cash on hand	$532.75	
8, Received from Walter Wellhouse, secretary	27.00	
1912.		
Jul. 15, Received interest	16.00	
Dec. 20, Received from Walter Wellhouse, secretary	48.00	
1913.		
Jul. 15, Received interest	16.00	$639.75
Awards paid for exhibition of horticultural products		114.00
Balance on hand		$525.75

REPORT OF AUDITING COMMITTEE.

We, the auditing committee, have examined the accounts of the secretary and treasurer and found the same to be correct.

Respectfully submitted.

J. J. ALEXANDER.
D. D. TUTTLE.
G. BOHRER.

REPORT OF OFFICIAL ENTOMOLOGIST.

By PROF. S. J. HUNTER, Lawrence.

It is always a matter of great pleasure to me to come before this society once every year to talk over the plans of the year just coming to a close. The purpose of our work in connection with the Entomological Commission is not entirely to destroy insects, but also to demonstrate the possibilities of Kansas soil and climate for production of fruit equal to any in the United States.

Now, in the first place, as you probably all know, we have an Entomological Commission, made up of Secretary Coburn as chairman, Secretary Wellhouse as secretary, the professor of entomology at the Agricultural College as one member, and the professor of entomology at the University as another member, and an active nurseryman as a fifth member, all serving without pay and giving their time and their abilities to the state without any additional cost. You will be interested in knowing just what is to be done. The commission has assigned the south half of the state to the entomologist of the University and the north half of the state to the entomologist of the Agricultural College.

I want to say a word to you about the operation of this law. We have had the heartiest coöperation of fruit growers, with possibly one exception. One man undertook to thwart the law, and carried it to the supreme court, with the result that the law as it stands at present was affirmed by the supreme court, all the judges concurring. Every point at issue was covered, and lawyers have said regarding that decision that

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it is a decision that gives a new interpretation of law. The result of this has been to strengthen the law. I attended a meeting not long ago with representatives from Oklahoma, Missouri, Kansas and Nebraska. Nebraska, Oklahoma and Missouri are desirous of putting such a law as ours on the statute books. The Oklahoma law is going to be repealed, and Nebraska wants just such a law as we have, and Missouri is after just the same thing.

Last year, after some fourteen years of agitation, a national bill was framed, based on this law of ours in so far that the active administration of the law is vested in a board. The horticulturists and agriculturists of this country, in this preliminary convention, of which I was a member, said they were not willing to trust the interests of this country even in the hands of the Secretary of Agriculture, and insisted that it be placed in the hands of a board.

G. A. BLAIR: Tell us about that commission.

PROFESSOR HUNTER: It is called a "board" in this case. The Secretary of Agriculture appoints the board of five, not more than two of which can be from any one bureau or office in the Department of Agriculture. One of those will be chairman and one will be secretary, and then there will be the other three members. They serve without additional compensation. Their work is to see that the importers into this country procure permission in advance; that all importations, when they arrive at the port of entry, are properly transcribed and the point of destination be notified; that is, the man who is to get the shipment. I should state that the proper officers receive notice that at such and such a depot or port certain stock has arrived; that the stock is to be shipped via such and such a route to a given party. The consignments are all opened by a member of this commission, or his appointee, and examined and certified as to their health. If there is anything wrong the consignment is destroyed; if not, a clear bill of health is given and the owner is allowed to open and make use of the stock. The report is signed by the state entomologist and forwarded to the chairman of this federal board at Washington.

G. A. BLAIR: Does this federal board do the inspection at the port of entry?

PROFESSOR HUNTER: No, sir. When it arrives at a port of course it usually comes in charge of some broker. The broker will notify you and he will notify me and notify the federal board. Then the federal horticultural board sends me a special blank, and that blank I take and go to your place. We open them up together, examining everything there, and if it is all right I fill it out, so stating, and if it is not all right it is destroyed.

G. A. BLAIR: They don't do it on the Pacific coast; they stop everything; at least they did when I was there a few years ago.

PROFESSOR HUNTER: They can do that for California alone, but they can not do it for other states.

G. A. BLAIR: My understanding is that nothing can enter that state or pass through it without inspection.

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PROFESSOR HUNTER: That whole question of inspection rests with the state. Thus we are responsible for protection. That question was brought up in all its phases, and a very strong effort was made to have all stock inspected at the port of entry, but it was demonstrated that the government would have it build enormous inspection warehouses.

G. A. BLAIR: Well, better build great warehouses than to have noxious insects and plant diseases sent all over the country.

PROFESSOR HUNTER: As I showed you before, we have been working with fruit growers in different parts of the state in coöperative experiments, and last year I spoke to you entirely from the standpoint of tests in which it does not pay to spray. This year I wish to talk to you from the standpoint of tests under which it does pay to spray. I tried to show you last year where practically all work connected with spraying was a waste of time and money. Our policy has been not only to work with large orchards, but more especially to pick out small tracts and encourage the growers to care for their orchards, because we find our commercial orchardists are wide awake. They have their money invested there, and do everything as nearly right as they can do it, whereas some of our smaller growers say it does not pay to spray. We took over an orchard for a term of years, paying $30 a year per acre cash rent, without any reference to frost or backsets; that is, $300 a year for a fraction short of ten acres of orchard.

The owner, in talking the matter over, said, "Here's one or two varieties I have never gotten a marketable apple from." Of course, among those were some Missouri Pippins. Beginning in the summer, we have Yellow Transparent. These were sold at $3 a bushel; Duchess of Oldenburg, $3.30 a bushel. Then there were, in the fall, the Jonathans, Grimes Golden, Winesap, Gano, Ben Davis, Willow Twig, and just a few York Imperials. With that in view, then, I think I would like to talk to you about this one orchard in detail. We wanted to see this year not only what was done with the marketable product, but we wanted to show what was the result of the year's work. All I have done in person this year is simply to counsel with the men from time to time as they came to see me about it. They had a tent in the orchard, and they lived and "batched" among the trees the greater part of the season, and the results are such, I think, as to show the activity, work and thought they put in.

Early in the spring they selected, after the blossoms had set, what they considered two or three representative trees in each variety. They took those trees and counted the "drops" once a month in May, June, July, August and September; picked up the drops. They also took them and scored them, so as to see what was the probable cause of the drop; so in that way, you see, they studied the orchard, taking these typical trees as fairly representative. So they were ready to show whether spraying helped the fruit to set on and whether it caused a larger percentage of marketable fruit. They were anxious to demonstrate the advantage of syraying only as few times as possible.

The first spray was lime-sulphur, a gallon and a half (commercial solution—Baumé 33) to fifty gallons of water, and two pounds of arsenate of lead to fifty gallons of water. That was put on when the blossoms were

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about half off, using driving spray nozzle and spraying each tree as though never expected to come back again. The second spray was put on about ten days later, using the same mixture.

G. A. BLAIR: What were those sprays intended for?

PROFESSOR HUNTER: Codling moth principally. A second spray ten days later, of same solution, was applied to those varieties which they thought might have blotch upon them. In about three weeks they applied Bordeaux mixture, to which they added two pounds of arsenate of lead.

PRESIDENT HOOVER: Don't you think it a rather dangerous proposition, spraying when the blossoms were half off?

PROFESSOR HUNTER: Let us see how that comes out. A portion they left unsprayed, uncultivated, unpruned, so as to have it for a check, and then they compared their experiments with orchards of same general surroundings. As a general proposition, taking the orchard as a whole, with three advanced students I went over the entire orchard and spent about a half day studying codling moth only. We found in half a day's search one wormy apple. On the 23d of July Secretary Wellhouse spent more than half a day with me in the orchard, and came away without finding a single wormy apple, and, I believe, one curculio pitted apple. On the 27th of July Mr. George Richardson spent the greater part of a day in the orchard, and we found five wormy apples, the worms having entered in the side, showing the reasonable conclusion that those were worms from moths that had blown in there from the checks or surrounding orchards.

G. A. BLAIR: Did you find any black deposit in your lime-sulphur solution?

PROFESSOR HUNTER: There is always a deposit.

G. A. BLAIR: What is that deposit, sulphur?

PROFESSOR HUNTER: It is sulphur; it is an excess.

G. A. BLAIR: You take that out of your arsenate of lead. The arsenate of lead is to hold the mixture on, keep it from burning the trees?

PROFESSOR HUNTER: Yes, sir; undoubtedly.

G. A. BLAIR: That deposit makes it less effective?

PROFESSOR HUNTER: You are putting in more than you need.

G. A. BLAIR: Will there be a precipitation if you use just one pound of lead?

PROFESSOR HUNTER: Always will be.

G. A. BLAIR: If you take plain water?

PROFESSOR HUNTER: If you were going to spray with arsenate of lead alone omit the lime and sulphur; that is n't true of Bordeaux.

G. A. BLAIR: I use, first spray lime and sulphur and arsenate of lead, and always get that precipitate, but I used that spray for caution in case there should be some scale, which I have never discovered, and also put in arsenate of lead for cankerworm, and got that precipitate; it seems to me that I am going to a lot of work which is not effective.

A MEMBER: You mean to say that these orchards you sprayed with lime and sulphur had the blotch?

PROFESSOR HUNTER: Yes, the year before.

G. A. BLAIR: What was the condition of the blotch?

PROFESSOR HUNTER: There was n't any blotch.

G. A. BLAIR: Not on the check trees?

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PROFESSOR HUNTER: Plenty of it.

G. A. BLAIR: You made three sprayings before July 1st for codling moth?

PROFESSOR HUNTER: Yes. In spraying these orchards we don't begin at one end and spray right through. We spray by varieties. If a tree is a little immature, we pass that and come back later.

G. A. BLAIR: Is it a fact that Grimes Golden and Ben Davis are more susceptible to bitter rot?

PROFESSOR HUNTER: The most susceptible would be Willow Twig, and next Ben Davis. It usually appears at the rose end, but wherever it appears there is a concentric ring.

PRESIDENT HOOVER: You spoke of bitter rot.

PROFESSOR HUNTER: Frequently in the rose end—outer end.

PRESIDENT HOOVER: I believe bitter rot, in nine cases out of ten, starts on the side of the apple.

PROFESSOR HUNTER: That has not been my experience. In a very large number of cases I find the depression, including the circle, will include in its circle the bitter rot.

A MEMBER: I would like to ask Mr. Hunter if those sprays, especially the last one, is good for bitter rot without spraying later?

PROFESSOR HUNTER: You mean the third spraying? I think so.

PROFESSOR HUNTER (continuing): The cost of handling, cost of spraying, is practically nothing. You have seen this fall quite a good deal said in the papers about a "glut," people feeding apples to hogs. This orchard had commission buyers in it two weeks before it was ready to pick, and the whole crop was taken at best prices. The sorting was simply a matter of picking out the smallest. The following tables will show conclusively the beneficial and commercial advantages of spraying an apple orchard.

SPRAY RELATION TO CROP PRODUCTION.

81,457 Apples counted.

	Variety	Total number set	May drops	July drops	August drops	September drops	Total number drops	Per cent dropped	Number picked	Per cent picked
Unsprayed.	Gano	4,069	1,241	333	388	468	2,430	41.70	1,639	58.30
	Jonathan	4,966	417	547	564	1,612	3,140	60.35	1,826	39.65
	Winesap	6,401	630	249	487	1,285	2,651	35.45	3,850	64.55
	M. B. Twig	1,942	605	307	364	457	1,733	84.40	209	14.60
Sprayed twice.	Jonathan, two trees	4,436	697	32	226	1,108	2,063	36.50	2,363	63.50
	M. B. Twig, one tree	5,656	2,678	19	61	83	2,841	5.47	2,814	94.53
	Winesap, two trees	8,741	989	14	294	236	1,433	5.73	7,287	94.27
	Grimes G., two trees	15,681	4,856	63	420	541	5,880	9.47	9,791	90.53
Sprayed three times.	Ben Davis, two trees	6,627	1,593	66	419	231	2,331	15.80	5,296	84.20
	Mo. Pippin, two trees	14,007	1,650	35	231	351	2,270	5.02	11,737	94.98
	Gano, two trees	8,931	1,889	97	400	404	3,690	25.28	6,366	74.72

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EFFICIENCY OF SPRAYING IN THE PRODUCTION OF SOUND FRUIT.

81,457 Apples counted.

	Total number of apples set.	Thinning drop, May.	Total number of unsound apples.	Total number of sound apples.	Per cent of sound apples.
Unsprayed orchard. Four trees counted	17,378	2,893*	12,369	2,116	14.60
Sprayed orchard. Two sprays. Seven trees counted	31,514	9,220*	1,592	23,702	93.81
Sprayed orchard. Three sprays. Six trees counted	29,565	4,847*	1,210	23,508	95.10

* Cause of drop undetermined and therefore not figured in the percentage of sound apples.

COMPARISON OF CODLING MOTH INFECTION IN SPRAYED AND UNSPRAYED ORCHARDS.

81,457 Apples counted.

	Variety	Per cent codling moth July drops	Per cent codling moth August drops	Per cent codling moth September drops	Per cent codling moth picked apples	Total per cent codling moth of all apples set
Unsprayed.	Gano	57.30	52.52	78.90	37.20	44.40
	Jonathan	92.15	74.35	74.60	49.50	56.30
	Winesap	92.00	52.30	76.30	19.20	32.80
	Black Twig	82.20	89.50	95.40	66 60	58.20
Sprayed twice: First, as petals fell with L. S., and L. A. Second, ten days later with L S., and A. of L.	Jonathan, two trees	21.85	4.42	1.44	0.88	2.02
	Black Twig, one tree	10.53	11.47	15.66	0.74	0.76
	Winesap, two trees	50.00	11.62	11.42	1.20	2.98
	Grimes G., two trees	20.31	6.66	9.79	0.64	1 47
Sprayed three times: First, as petals fell with L. S. Second, ten days later with Bd. M., and A. of L. Third, July 1, Bd. M., and A. of L	Ben Davis, two trees	7.58	2.62	6.07	2.53	2.33
	Pippin, two trees	17.15	6.46	7.84	0.80	1.03
	Gano, two trees	11.33	3.00	5.45	2.20	2 04

COMPARISON OF CURCULIO INFESTATION OF SPRAYED AND UNSPRAYED ORCHARDS.

81,457 Apples counted.

	Variety	Per cent curculio, August drops	Per cent curculio, September drops	Per cent curculio, picked apples	Total per cent curculio, apples set
Unsprayed.	Gano, one tree	19.60	18.46	29.22	13.70
	Jonathan, one tree	15.13	21.85	40.52	22.23
	Winesap, one tree	23.66	22.66	48.54	33.92
	Black Twig, one tree,	2 47	10.50	17.19	4.28
Sprayed twice: First, as petals fell, L. S. Second, ten days later, L. S. and A. of L.	Jonathan, two trees	10.60	0.36	6.06	3.50
	Black Twig, one tree,	4.92	12.04	2.83	1.64
	Winesap, two trees	6.52	2.52	3.81	3.40
	Grimes Golden, two trees	10.48	8.50	1.78	1.69
Sprayed three times: First, as petals fell, L. S. Second, ten days later, Bd. M. and A. of L. Third, July 1, Bd. M. and A. of L.	Ben Davis, two trees	5.00	7.67	2.36	2.53
	Pippin, two trees	5.18	6.22	1.87	1.84
	Gano, two trees	8.00	4.21	3.57	2.52

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COMPARISON OF BITTER ROT INFESTATION IN SPRAYED AND UNSPRAYED ORCHARDS.

81,457 Apples counted.

	Variety.....	Per cent bitter rot, July drops.	Per cent bitter rot, August drops.....	Per cent bitter rot, September drops.....	Per cent bitter rot, picked apples.....	Total per cent bitter rot, apples set.....
Unsprayed.	Gano.....	4.77	4.64	22.66	9.70	7.40
	Jonathan.....	.91	2.13	13 53	6.96	8.14
	Winesap.....	.00	6.57	27.07	11.16	11.10
	Black Twig.....	.30	3.85	15 56	3.35	4.78
Sprayed twice: First, L. S., as petal fell. Second, L S. and A. of L. ten days later.	Jonathan, two trees..	0.00	3.61	0.18	0.29	0.67
	Black Twig, one tree..	.00	4.92	6 02	0.00	.14
	Winesap, two trees...	.00	6.05	.00	.41	.77
	Grimes Golden, two trees.....	1.58	3.09	4.25	.06	40
Sprayed three times: First, L. S. and A. of L. as petals fell. Second, Bd. M. and A. of L. ten days later. Third, Bd. M. and A. of L. Ju'y 1.	Ben Davis, two trees..	0.00	3.12	12.02	1.32	1.82
	Pippin, two trees.....	.00	3.54	.28	.29	.32
	Gano, two trees.....	.00	9.00	4.95	.83	1.20

G. A. BLAIR: Professor Hunter, I failed to note in your report what has been the extent—that is, what have you got for that $10,000 that was appropriated by the legislature, in results.

PROFESSOR HUNTER: For my part, I will say that we have cleaned up in five counties. We discovered small infestations in one or two counties. I wish I could give you a photograph of the country I went down through the first time, showing you the neglect of practically all orchards southwest—I mean the smaller orchards. Cleaning up and burning that, I think is itself more valuable than the whole ten thousand dollars.

G. A. BLAIR: The affected area is increasing down there; it is spreading out.

PROFESSOR HUNTER: That was not our observation.

G. A. BLAIR: I understand that is the case over near Holton; but the fact is, it is spreading.

PROFESSOR DEAN: The man who says that scale is increasing near Holton does n't know what he is talking about. We have made inspection of all this territory that had scale. We have gone back to some places where they had it before, and when we say that the scale has n't spread we know what we are talking about. You can go into Professor Hunter's territory; a man said yesterday the entomologist was not attending to his business at all. I was right on that place. That man has no scale on his place, yet he will come up here and say that the entomologist is not attending to his duty. Some people say we are wasting our time because we make these reinspections. How are we going to find out whether we are making progress or not? Then we know, and we know accurately, whether that scale has spread any, and I have no patience with a man who will stand up and say without proof that the scale has spread. I am speaking of the north part, and any man who tells you the scale has increased has got to show the goods.

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J. L. WILLIAMS: There has not been anything come to the state of Kansas that has done so much good as the San José scale. We have other things bothering all our apples: curculio, bitter rot, and about a thousand kinds of fungus. We all know the scale came here and the people had all gone to sleep all over Kansas. We could not wake them. I have been spraying for thirty years, and I have enough money to take me home. When the San José scale got into Kansas and the entomologists got started they woke the people up. There are a thousand spraying orchards over Kansas, where five years ago there was n't one. We are going to have lots of fruit right along, scale or no scale, and we are going to kill the scale. (Applause.)

REPORT OF OFFICIAL ENTOMOLOGIST.

By PROF. GEO. A. DEAN, Manhattan.[1]

Ladies and Gentlemen of the Kansas State Horticultural Society:

During the year just passed, entomological work has been conducted along each of the five lines: (1) The regular inspection and certification of all nurseries growing stock in the northern half of Kansas; (2) careful examination of all nursery stock shipped into north Kansas from abroad; (3) location and suppression of the San José scale; (4) orchard spraying demonstration work; (5) honeybee pollination experiments.

NURSERY INSPECTION.

All nurseries were subjected to a searching examination and were found to be entirely free from San José scale and seriously injurious plant diseases. In one nursery the apple seedling stock had suffered severely from the attack of the termite or white ant (*Termes flavipes*). In another nursery this same species of insect had seriously injured one- and two-year-old budded stock. In several of the nurseries growing apple-seedling stock, the woolly aphis was doing serious injury, in some cases causing more than ten per cent of the stock to be condemned. Inasmuch as the protection of seedling apples from infestation by the woolly aphis, while still in the nursery, has heretofore been an exceedingly difficult matter, undoubtedly the apple-seedling growers, as well as the orchardists, will be greatly interested in the recent important discoveries of Dr. Edith M. Patch, Associate Entomologist of the Maine Agricultural Experiment Station.[2] In her investigations she has discovered that the elm-leaf curl harbors the apple woolly aphis, and no doubt the elm-leaf curl will be a very important factor to be taken into consideration in dealing with the woolly aphis of the apple. From the information as given in Dr. Patch's report, the source of danger lies in the migrants from the previously unsuspected elm curl, and the infestation of nursery stock may be controlled by establishing nurseries at a safe distance from susceptible trees or clearing out the elm from the vicinity of large nurseries. Thus from her report the raising of elms and apples in the same nursery is a hazardous proceeding and should be

1. Entomologist since October 1, 1912.

2. Bul. 203, Maine Agr. Exp. Sta., August, 1912.

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avoided. Again, young apple orchards or clean stock set in parts of the country where the elm is not grown should be successfully protected by excluding the elm usually grown on the premises as shade trees.

INSPECTION OF IMPORTED NURSERY STOCK.

The Federal Horticultural Board, Washington, D. C., has furnished the entomologists notice of all shipments into Kansas of foreign nursery stock, and as in the past, the stock consigned to northern Kansas was given a thorough inspection before it was offered for sale or distribution.

The entomologist feels that with the protection of the federal plant quarantine act, August, 1912, the introduction of the brown-tail moth, gipsy moth, and other seriously injurious insects will be reduced to a minimum, and with the careful discharge of the duties pertaining to the office of the state entomologist, together with the proper coöperation of our growers and dealers of nursery stock, these pests should never gain a foothold in this state.

In regulation 3 of this act, all persons contemplating the importation by mail, express, freight, or other forms of transportation of nursery stock from any part of the world will first make application to the Secretary of Agriculture for a permit, stating in the application the general nature and quantity of the nursery stock, the district or locality where grown, the name and address of the exporter, together with name and the address of the importer in the United States, and the proposed port of entry.

In section 3 of this act, no person shall import or offer for entry into the United States any nursery stock unless the case, box, package, crate, bale, or bundle thereof shall be plainly and correctly marked to show the general nature and quantity of the contents, the country and locality where the same was grown, the name and address of the shipper, owner, or person shipping or forwarding the same, and the name and address of the consignee.

Regulation 8, taken from sections 2 and 5 of this act, states that immediately upon the entry and before removal from the port of entry of shipments of nursery stock, the person receiving the stock shall notify the Secretary of Agriculture in writing, stating the number of the permit, the general nature, age or height, and quantity of the nursery stock, the country and locality where grown, the date of entry, and the name and address of each of the consignees to whom it is proposed to forward the nursery stock, together with the probable date of delivery for transportation. At the same time a copy of the notice to the Secretary of Agriculture shall be sent to the duly authorized inspector or other officer of the state, territory, or district to which the nursery stock is to be shipped.

Upon the arrival of this stock in the state, either the entomologist or one of his duly authorized inspectors has inspected all stock reported and has reported to the chairman of the Federal Horticultural Board the condition thereof. With each notice the chairman of the Federal Horticultural Board sends two blank reports to be filled out by the inspector, one of which is to be sent to the chairman of the Horticultural Board and the other retained for the files in the office of the state entomologist. Since the federal law does not make it obligatory upon the state ento-

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mologist to inspect this stock, the entire responsibility for the inspection of imported stock is left entirely with the state entomologist, and if he does not make the inspection the nursery stock must necessarily go unexamined.

It requires no argument that provisions for the inspection of this imported stock should be made by the state, both to protect against the local establishment of new pests and also to avoid in such cases a quarantine which may result from the neglect or careless performance of inspection. Although the return of the report on the blank furnished by the Federal Horticultural Board giving the result of the inspection is not required by law, it is a courtesy which every state inspector should extend to the federal Department of Agriculture.

THE REGULATION OF THE QUARANTINE ACT AS APPLIED TO THE SHIPMENT OF DOMESTIC NURSERY STOCK FROM TERRITORIES INFESTED WITH GYPSY MOTH AND BROWN-TAIL MOTH.

Gypsy Moth Regulations. Coniferous trees of the area quarantined for the gypsy moth, such as spruce, fir, hemlock, pine, juniper (cedar), arbor vitæ (white cedar), known and described as "Christmas trees," and parts thereof, and decorative plants of the area quarantined for gypsy moth, such as holly and laurel, known and described as "Christmas greens or greenery," shall not be moved or allowed to move interstate to points outside the quarantined area.

Forest plant products of the area quarantined for gypsy moth, including logs, tanbark, posts, poles, railroad ties, cordwood, and lumber, and field-grown florists' stock, trees, shrubs, vines, cuttings, and other plants and plant products for planting and propagation, of the area quarantined for the gypsy moth, excepting buds, fruit pits, seeds of fruit, and ornamental trees and srubs, field, vegetable and flower seeds, bedding plants and other herbaceous plants and roots shall not be moved or allowed to move interstate to any point outside the quarantined area unless and until such plants and plant products have been inspected by the United States Department of Agriculture and pronounced free from the gypsy moth.

Brown-tail Moth Regulations. Deciduous trees or shrubs of the area quarantined for the brown-tail moth or parts thereof, including all deciduous field-grown florists' stock, vines, cuttings, grass, and scions shall not be moved or allowed to move interstate to points outside the quarantined area unless and until such plants and plant products have been inspected by the United States Department of Agriculture and pronounced to be free from brown-tail moth.

General Regulations. (1) Every car, box, bale, or other container of plants and plant products of which inspection is required by these regulations shall be plainly marked with the name and address of the consignor and the name and address of the consignee, and shall bear a certificate showing that the contents have been inspected by the United States Department of Agriculture and found to be free from moth infestation.

(2) Carload and other bulk shipments of plants and plant products for which inspection is required by these regulations shall not be trans-

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ported or offered for transportation interstate by cars, boats, and other vehicles, unless each shipment is accompanied by a certificate showing that the plants and plant products have been inspected by the United States Department of Agriculture and pronounced to be free from moth infestation. The inspection certificates shall accompany the waybills, conductors' manifests, memoranda, or bills of lading pertaining to such shipments made by cars or boats.

(3) Certificates of inspection will issue only for plants and plant products which have been actually inspected by the United States Department of Agriculture, and the use of such certificates in connection with plants and plant products which have not been so inspected is prohibited.

(4) Plants and plant products, of which the interstate movement is prohibited or restricted by these regulations and which are grown outside the areas quarantined for the gypsy moth or the brown-tail moth, may be shipped interstate from points within the quarantined areas to points outside the quarantined areas under permit from the Secretary of Agriculture. Permits will issue only for plants and plant products which are not infested with the gypsy moth or brown-tail moth, and transportation companies shall not accept or move interstate from within the quarantined areas such plants and plant products grown outside the quarantined areas, unless each shipment is accompanied by a permit issued by the superintendent of moth work at Boston, Mass.

SAN JOSÉ SCALE.

During that part of last winter and early spring which would permit of work much of the time was given to personal work among the fruit growers, assisting them in getting spraying apparatus in working order and showing them how to spray. At the same time the public sprayers were kept in operation, and in so far as possible a general "follow up" plan was pursued. During the summer and fall a property-to-property inspection was made of all infested districts, with the exception of that part of the Kansas City district lying within the city limits. This inspection covered not only the territory known to be infested, but extended in all directions from the infested district, in order to ascertain for a certainty that there was no scale beyond the limits of the infestation. The condition of all orchards and plantations, whether infested or not, was recorded and all information regarding them placed on file in the office of the state entomologist. During the winter and spring of 1913, it is planned to keep the public sprayers in operation for the purpose of spraying all plantations where the owners do not care to go to the trouble of treating.

While the entomologist is pleased to report that the scale has not spread beyond the limits of the previously infested districts, and has been greatly reduced within the infested areas, he regrets to report the finding of two entirely new infested localities, one in the city of Marquette and a small portion of the surrounding country, and the other in the city of Lindsborg, both of which are situated in the northern part of McPherson county. In both of these districts, almost without exception, the citizens

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whose properties were found infested showed the very best spirit of co-operation, and were very anxious to learn about the scale and the best means of controlling it.

GENERAL SUMMARY OF THE INSPECTION WORK IN EACH LOCALITY.

	Doniphan county	Jackson county	Jewell county	McPherson county.		Wyandotte county.	Total
				Marquette.	Lindsborg	country	
No. of sq. miles inspected	30	39	15	12	19	51	166
No. of plantings inspected	274	660	41	132	425	565	2,097
No. of sq. miles infested	3	9	¼	¼	1	33	46.5
No. of plantings infested	117	184	1	30	124	217	673
No. of plants inspected:							
Individual plants	74,278	26,917	4,400	2,750	8,500	149,951	266,796
Acres	586.75	20	4	.....	¼	29 5	640.5
Rods	.....	140	40	50	400	29	659
No. of plants infested:							
Individual plants	3,018	1,963	30	278	1,427	21,748	28,464
Acres	.....	.....	.....	.....	.....	.....	.....
Rods	.....	.....	.....	.....	.....	25	25

RESULTS.

The principal results of the last year's work have been educational, and can best be summarized by quoting from Doctor Headlee's report to the Entomological Commission for the year 1910. "All or practically all of the owners or tenants of the infested plantings, as well as many of their friends and acquaintances, have had an opportunity to see the treatment for scale applied and to observe the results. The necessity of outfitting themselves for destroying the scale, and the resultant familiarity with the use of spraying machines and materials, have naturally led the fruit growers to summer-treat their fruit trees for other injurious insects and plant diseases in the hope of improving the quantity and the quality of the yield."

In two of the infested districts a healthy interest has been aroused in scale control by demonstrating that with a reasonable expenditure of time and money the infestation in these badly infested plantings can be brought under control and the plantings made to produce good fruit.

The infestation in the Doniphan, Jackson, Jewell, and Wyandotte county districts has not spread, but, on the other hand, has experienced a marked reduction in the abundance of the scale.

THE OUTLOOK.

Inasmuch as the San José scale has never been eradicated from any country where it has obtained such a foothold as it has in Kansas, we might as well accept the proposition that to eradicate the scale is impracticable, but to control it is perfectly practicable. General results of the treatment with lime-sulphur sprays, even with a single spraying per year, during the dormant season, will easily and efficiently control the scale. The inspections of the infested areas show that its rapid progress can be stayed, its damage reduced from absolute destruction of thousands of fruit trees to where it becomes merely a spur to compel the orchardists to practice those measures that are needed for the production of high-grade

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fruit. Doctor Headlee, in one of his reports, says: "Indeed, so thoroughly are many of the fruit growers in the infested districts convinced that this is true, that they have ceased to fear the scale, and some of them have expressed themselves as well pleased that at last something has arrived which will put the shiftless fruit grower out of commission." He further says that "the all-important and the constructive movement against the scale must be made along the line of arousing interest in fruit growing as a profitable business, through public education in methods of selection of soils and varieties, cultivation, pruning, frost protection and spraying."

DEMONSTRATION SPRAYING.

During the last three years the Agricultural College, through its Departments of Extension, Horticulture, and Entomology, has not only made good progress in demonstration spraying, but by arousing interest has succeeded in getting a large number of orchardists to spray. In all communities in which demonstration spraying has been done the orchardists have shown a good spirit of coöperation, and a majority of those living in the communities are convinced that paying crops can be produced by protecting the fruit from insects and fungous diseases.

Last year the Department of Entomology carried on its demonstration syraying in seven widely separated orchards in Wyandotte county and several in Doniphan county. In each of these orchards a block of from thirty-six to fifty-four trees was selected and given the usual number of sprays. In each of the orchards another block, consisting of the same number of trees, was left unsprayed for comparison. In return for this work the owner was to give the state the crop from one-half of the treated trees to cover the expense incurred in the spraying.

In addition to the several orchards that received direct treatment, many orchards were treated under direction of the Agricultural College, while a still larger number were treated as per advice from the Agricultural College. The reception accorded to this work has been so encouraging and the results so convincing that the Departments of Extension, Horticulture and Entomology feel that it is a line of work thoroughly worth developing in all the different parts of the state where orchards are grown. In addition to the demonstration work out over the state, direct experiments for the control of codling moth, curculio and fungous diseases have been under way in orchards at Manhattan.

In summarizing the report prepared by Mr. W. E. Watkins, assistant entomologist in charge of the work in Wyandotte county, the writer finds that in all the orchards there was an average increase of merchantable apples of about four bushels per tree; that the demonstration work has convinced the orchardists that by protecting their trees from injurious insects and diseases they could produce a much larger yield of first-class fruit; that it has given excellent results from an educational point of view and has aroused interest and a healthy spirit of coöperation; that without a single exception, not a word of complaint has come from any one who took time to investigate the work; that a still better quality of fruit could be produced if demonstration work could be conducted in proper pruning and thinning of fruit.

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In summarizing the results of the work in Doniphan county, Mr. J. H. Merrill, assistant entomologist in charge of the work, says: "The result of the increased returns from sprayed orchards has been an awakening to the necessity of spraying. Sprayed fruit not only brought better prices, but was more easily disposed of, while those who did not spray found it hard to sell their apples at a good price, and in many cases were forced to sell them at a sacrifice. Several more orchardists are planning to purchase spraying outfits and in the future to consider the orchard something more than a by-product."

The following facts and figures, taken from Mr. J. H. Merrill's report of orchard spraying in Doniphan county, show the increased returns when the orchard is properly sprayed:

Mr. Forest Kent's orchard, Troy:

1910—800 barrels of bulk apples.

1911—Although the bloom was as good as in 1912, the apples were so inferior that they were given to a man for the picking. Not more than $80 worth were sold.

1912—4600 barrels of good apples. Forty cents per hundred was received for the apples left on the ground after the main crop had been gathered. This orchard was sprayed five times, following the direction of the Agricultural College, both in the number of sprays and their composition.

Mr. F. W. Kotsch's orchard, Troy:

This orchard in previous years had been severely injured by the curculio, but in 1912 the cluster-cup spray was so successful in its results that it was practically impossible to find any signs of damage by this insect. The best previous yield of this orchard was in 1910, at which time there were five carloads of apples, two of which were of ordinary commercial pack, one of car bulk, and the other two of cider apples. The entire crop sold for $1690.69. This year the orchard produced 20 carloads of choice No. 1's, 3 cars of No. 2's, and 1 car of cider apples. From less than 25 acres of orchard, or a total of 1000 trees, he received $8070.50. The cost of the treatment was $212.83 plus $275 for a power sprayer. Sprays 1, 2, 3 and 5 were applied.

Mr. Geo. T. Groh's orchard, Wathena:

Mr. Groh has an orchard of 560 trees. In previous years this orchard had been a prey to curculio, codling moth, and various fungous diseases. Last spring Mr. Groh purchased a spraying outfit against the advice of many of his neighbors. Shortly after applying the third spray this orchard was seriously injured by a severe hailstorm. Believing that there were not enough good apples left to warrant the added expense, no more sprays were applied. Yet in spite of the damage done by the hail, this orchard netted the best returns in its history. In 1911 the orchard produced 750 bushels of bulk apples. In 1912 it produced 4200 bushels of good apples and 2000 bushels of bulk. The large percentage of bulk apples was directly due to the damage by the hail. Previous to this hailstorm an experienced apple buyer visited the orchard and predicted that it would run over 90 per cent of sound apples.

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SPRAYING SCHEDULE.

The spraying of the last three years has given us data for recommending the following as a good schedule of treatment for an apple orchard:

1. *Cluster-cup.* This spray is composed of lime-sulphur-lead-arsenate, and is applied in the interval between the opening of the cluster buds and the opening of the blossoms. This spray has prevented 20 per cent of the normal curculio damage. It will destroy cankerworms and other leaf-feeding insects. It is also known to reduce apple scab.

2. *Blossom-fall.* This spray has the same composition as No. 1, and is applied between the dropping of the petals and the closing of the calices. This spray has prevented 67 per cent of the normal codling-moth damage and 43 per cent of the normal curculio damage in 1911, and effected a small reduction in the apple blotch of the same year.

3. *Ten-days-after-blossom-fall.* This spray is applied ten days after the blossoms fall. It has the same composition as No. 1. It has reduced codling-moth and curculio injury. In an orchard at Troy, Kan., that in previous years had been severely injured by the curculio, this spray, in 1912, together with No. 1 and No. 2, so reduced the curculio injury that it was practically impossible to find signs of damage. If the weather should be dry and promises to remain so at the time of this spraying, the Bordeaux-lead-arsenate should be used. This is particularly true where apple scab is prevalent.

4. *Three-weeks-after-blossom-fall.* The material for this spray is Bordeaux-lead-arsenate, and is applied three weeks after the blossoms fall. It has reduced the normal codling-moth damage by 12 per cent, and when taken with No. 5 reduced the normal apple-blotch damage by 37 per cent. It is also known to reduce apple scab.

NOTE.—Lime-sulphur may be, and frequently is, used instead of the Bordeaux in this treatment, especially where apple blotch is not present.

5. *Ten-weeks-after-blossom-fall.* This spray is composed of arsenate of lead at the rate of two pounds to fifty gallons of water and is applied ten weeks after the blossoms fall. It may or may not be used with a fungicide. It reduces the damage from codling moth and with Bordeaux lessens the apple-blotch injury.

THE RELATION OF THE HONEYBEE TO OTHER INSECTS IN CROSS-POLLINATION OF THE APPLE BLOSSOM.[1]

It has long been known that a large number of our common varieties of apples are self-sterile, and therefore dependent on foreign pollen for fertilization. In an experiment carried on at the Oregon Experiment Station with 87 varieties of apples, 59 varieties were found to be self-sterile and the other 28 varieties, while only partially self-fertile, gave much better yields when cross-pollinated. It was also found that cross-pollination is the rule and self-pollination the exception. What factors enter into the carrying of pollen has been more or less of an open question. The wind, honeybees and other insects have all been regarded as

1. Written by James W. McColloch, assistant entomologist of the Kansas Agricultural Experiment Station.

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necessary, and some work has been done on the importance of each. In most cases the wind has been found to play a very little part in the transmission of pollen, while honeybees, wild bees and other insects have been found to be necessary for cross-pollination.

It was with an idea of determining the value of the honeybee and other insects in cross-pollination that the following work was taken up at the Kansas Experiment Station. Wind was not considered as a factor in the transmission of pollen because all our observations show that where apples are grown far from any apiary, the trees set very little fruit and that of inferior size.

Just before blossoming time two Ben Davis, two Missouri Pippins, and two Winesaps were selected in an orchard in which several stands of bees had been placed, and one Ben Davis, one Missouri Pippin, and one Winesap were selected in an orchard located over one-half mile from the nearest apiary. When the trees began to blossom on May 1st the men began making collections of all insects found visiting the flowers. These collections were made regularly during the daytime and often far into the night. The work was arranged so that each tree was visited at least once every two hours, and all insects found on the flowers were caught and preserved, or when not caught were recorded. About twenty minutes were spent at each tree and in that time each tree was encircled twice and carefully inspected for insects. At night or when dark a strong battery light was used to examine the blossoms.

During the day the tame bees were the predominating insects. They began flying early in the morning and continued until sundown or a little later. During very cloudy or windy weather, they were less numerous. The following table shows the time in the morning that they were first observed on blossoms and also the time they ceased to visit the blossoms:

Date.	Began flying.	Weather.	Quit flying.	Weather.
1912.				
May 1..	.....	.....	About 6:30 P. M...	Hazy, light wind.
May 2..	About 7:00 P. M...	Clear, warm, light wind.	About 7:00 P. M...	Partly cloudy, cool, fairly strong wind.
May 3..	About 6:30 P. M...	Cloudy, slightly humid, strong wind	About 6:00 P. M...	Partly cloudy, warm, slight wind.
May 4..	Before 8:00 A. M..	Partly cloudy, cool, light wind	About 6:00 P. M ..	Clear, warm, light wind.
May 5..	Before 8:45 A. M..	Warm, slightly humid, light wind	About 6:00 P. M...	Clear, warm, strong wind.

The bees never began flying in the morning until the dew had practically disappeared.

Small syrphus gnats were also present every day from sunrise until sunset and they were occasionally observed in blossoms. They would dart in under the stamens and pistils and remain only for a moment or two on the blossom.

The red admiral butterfly (*Vanessa atlanta*) was the predominating butterfly, and almost any time during the day one or two could be seen on a tree. They generally alighted on the edge of the blossom or on a near-by leaf and thrust their tongue down through the stamens. The clearwing moth was the only moth observed visiting the flowers in the daytime. They appeared to hover over the blossoms and to thrust their

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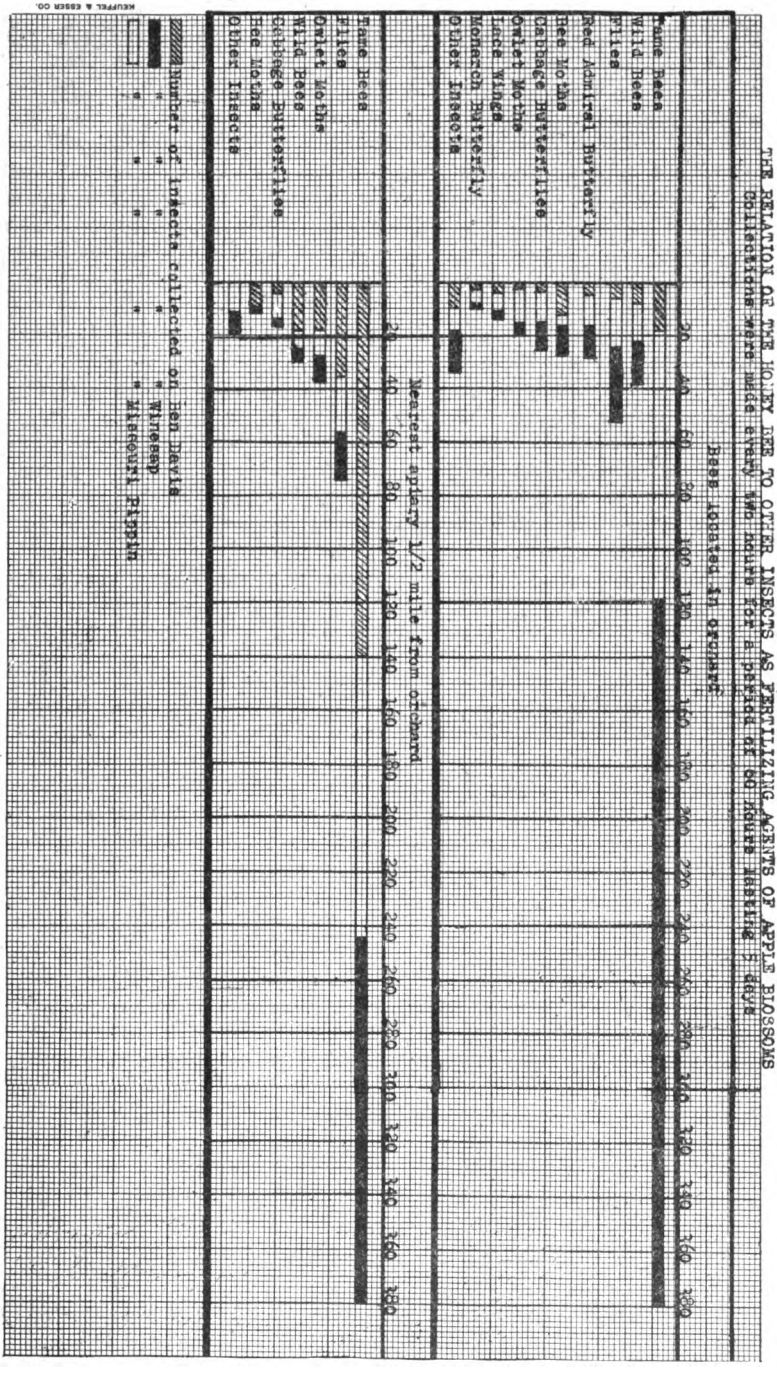
THE RELATION OF THE HONEY BEE TO OTHER INSECTS AS FERTILIZING AGENTS OF APPLE BLOSSOMS
Collections were made every two hours for a period of two hours during 5 days
Bees observed on Orchard
Nearest apiary 1/2 mile from orchard
Honey Bees
Wild Bees
Flies
Red Admiral Butterfly
Bee Moths
Cabbage Butterflies
Owlet Moths
Lace Wings
Monarch Butterfly
Other Insects
Number of insects collected on ten Davis
Witness
Missouri Pippin

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tongues down through the stamens to the nectar. After sundown a few noctuid moths would visit the blossoms, but at no time were they very numerous. They generally flew among the blossoms near the top of the tree and were difficult to catch. A few flies, mostly Muscidæ, were present during the day, but few of them were seen on flowers. Wild bees began to appear May 2, and became more numerous each day.

After 8 P. M. very few insects were found around the trees. Aside from the Noctuidæ above mentioned, the only insects observed were June bugs, and all night these were so numerous that 20 or more could be collected in ten minutes. They did not feed on the blossoms, although several were found resting on them.

The chart on the preceding page shows the number of honeybees caught in each orchard in comparison with other insects.

Aside from the collection of insects some observations were made on the number of blossoms a honeybee would visit on a trip. In one instance a bee, which already carried some pollen on its legs, was followed while it visited sixty-one blossoms and was then lost sight of in the top of the tree. Another was watched while it visited fifty-three blossoms, and several were followed while they visited from twenty-five to forty blossoms. As a rule the bees were always more numerous on the sunny side of the tree and apparently showed a preference for that side of the tree. They also seemed to prefer the trees with the most bloom, and as quickly as the petals began to fall the bees ceased visiting the tree.

SOME RESULTS OF SPRAYING IN 1912.

By J. H. Merrill, Assistant State Entomologist, Manhattan.

The original plan in the spring was to secure a number of orchards for demonstration work. A block of fifty trees was to be selected from each orchard and given the usual number of sprayings. In return for the work the owner was to give the state the crop from twenty-five of the fifty trees to pay the expense incurred in spraying. While this plan was carried out in Wyandotte, it was found to be impracticable for Doniphan county, and was abandoned with one exception, namely, an orchard belonging to Mike Forrest, at Troy.

At Wathena a twenty-acre orchard, which was notorious for its poor yields, was secured. Mr. L. A. Libel leased the orchard and agreed to pay all expenses for spraying, but the work was done under the direct supervision of the assistant state entomologist. In 1910 this orchard produced an abundant crop of inferior apples, but owing to the fact that apples were high that year, they secured $500 for the entire crop. In 1911 there was a crop of from fifteen to twenty thousand bushels, but they were of such an inferior grade that only about one-sixth of them were picked. This crop sold for $75. We felt that by doing demonstration work in such a poor but well-known orchard we could show the benefits of spraying.

Just before the buds opened the cluster-cup spray, consisting of two pounds of arsenate of lead and one and a half gallons of lime-sulphur to fifty gallons of water, was applied. This spraying was aimed primarily

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at the curculio, and the results were most satisfactory. On two unsprayed check trees 75 per cent of the fruit was stung by curculio, while it was practically impossible to find any such damage on the sprayed fruit.

The second spray, consisting of the same materials and used in the same proportions as in the first spray, was applied just after the petals fell, so as to get the spray into the still open calyx. This spray was intended to combat the codling moths that might attempt to enter the apple through the blossom end. As about 75 per cent enter this end, this spray also gave good results.

The third spray, with the same materials and combinations as the first two, was put on ten days after the blossom-fall. This was to control some of the curculio, some codling moth, and fungous diseases. The treatment of the trees with arsenate of lead as an insecticide had been very successful, and by adding the lime-sulphur to it the fungous diseases had also been controlled. The results in orchards that omitted this spray were as good as in those where it was used.

The day before we were to apply the fourth spray—this is the three-weeks-after-blossom-fall spray, a very severe hailstorm occurred. About half the fruit was knocked off and a large percentage of that remaining was badly damaged. At that time it looked as though the crop would be a total failure, yet the condition of the sound apples remaining on the trees was so good that Mr. Libel sold the crop for $951.95.

After the hailstorm we discontinued our spraying operations, but the majority of people were convinced, even at this point, of the value of spraying as a financial proposition of increased returns.

As this orchard was situated within the city limits, it offered an excellent opportunity for the fruit growers to watch the method of application and to observe the results. It was very gratifying to note the change in the attitude of many from doubt to belief.

The first spray was put on at about 150 pounds pressure, as our only desire was to cover the small leaves and buds with the spray material. The second spray, directed at the codling moth, was put on at 250 pounds pressure, as we wished to force the spray into every calyx on the tree. The third spray was put on at about the same pressure as the first, but as the weather was very warm by this time, and as we were afraid of burning the foliage with the lime-sulphur, we held the nozzles quite a distance from the tree and allowed the spray to float in as a mist. The weather was too threatening to use Bordeaux mixture, and as we needed a fungicide, we used the lime-sulphur in the manner just described.

At Troy the State Entomological Commission had charge of the work in three orchards. Mr. Rees Hillis leased the Wyckert orchard, of about 800 trees, and sprayed it five times under state supervision. Mr. Hillis applied his sprays in a similar manner to that used in Mr. Libel's orchard at Wathena. For the fifth and last spray arsenate of lead alone was used, it being altogether too warm to risk using lime-sulphur. This orchard was slightly damaged by hail, yet very satisfactory results were obtained.

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Mr. Joseph Hagenbuch, of Troy, had an orchard of about 600 trees which had never been sprayed. When he heard of the work the state was doing he requested us to put on two sprayings in his orchard. The blossom-fall spray and another about two weeks later were applied, these being as many as Mr. Hagenbuch cared for at the time.

Previous to this year the highest price he had ever received for his crop was $365. This year fruit only set on about 225 trees, yet he received $1000 for his apples. It cost him $50 to have his trees sprayed. Mr. Hagenbuch is now a thorough convert to the idea of spraying. He says he made a mistake in not putting on more sprays, but is going to get a machine and give spraying a thorough trial next year.

In Mr. Forrest's orchard, at Troy, we sprayed a block of fifty trees, which he selected for us. We were unable to put on the cluster-cup spray, but began with the blossom-fall spray, then put on the ten-days-after, another three weeks after, and finally the ten-weeks-after-blossom-fall spray. The first three sprays consisted of two pounds of arsenate of lead and one and a half gallons of lime-sulphur to every fifty gallons of water. The fourth spray consisted of arsenate of lead alone. The average amount of spray material used on each tree treated was five gallons. The first spray was put on at 250 pounds pressure, but the others were applied at lower pressure, care being taken to apply it as a mist so as not to burn the foliage. As this orchard was six miles from town, the cost per tree for the entire treatment would be very high, but the cost of material was 14 cents per tree. Some pruning had been done in this orchard, but it would have been improved by more thinning. The rest of the orchard was not sprayed.

The result of the spraying can be best shown by quoting Mr. Forrest's own statement. He said that he selected the fifty meanest trees he had in a poor section of the orchard. He felt that if we wanted to fight insects he would give us some to fight. In previous years, when the apples in the rest of the orchard were 80 per cent good, those on the trees we sprayed were never worth picking. His sister said she never got apples enough off those trees to make an apple pie. This year Mr. Forrest said that the sprayed trees were the only ones from which he picked the fruit. The rest of his apples he shook off. He was very much pleased with the outcome and reported to his friends what our results had been. He is planning now on buying a spraying machine, because, as he says, "A man can't raise apples unless he sprays."

Another phase of the work was assisting those who owned their own machines and were going to do their own work. Some of these men had sprayed before, but a good many were going to spray this year for the first time. I felt that if these new men sprayed successfully it would be a great advertisement for spraying. On the other hand, if they sprayed and made a failure of the work, it would seriously injure the cause of spraying. For this reason, I tried to assist as many of them as possible. Some of them I visited each time they sprayed, and gave them what assistance I could. Just previous to the time to put on each spray, I would have an article appear in the Wathena *Republican*, the Wathena *Times*, and the *Kansas Chief*. In these articles I stated that it was time

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to spray, the purpose of the spray, its composition, how to prepare it, also how to apply it. There were so many spraying, and my time was limited, that I could reach the orchardists as a whole better through the papers. Though we tried to reach most of the orchardists through the papers and by personal interviews, several of them, wishing further information, used the telephone.

Below will be given some facts and figures from sprayed orchards in Wathena and Troy:

Frank Kotsch, county treasurer, on less than twenty-five acres of orchard near Troy, received this year over $8000. The best previous record for this orchard was in 1910, when he got five carloads of apples, two of which were ordinary commercial pack, one of bulk and two of cider apples. This year he got twenty carloads of extra choice orchard run, or No. 1, apples, five cars of bulk, and one of cider apples.

The orchard now owned by George Foster Kent, adjoining Troy, in 1910 produced eight hundred barrels of bulk apples. In 1911 there was as good a bloom as this year, but the apples were given to a man for picking them, except about $80 worth that were sold. In 1912 the orchard was sprayed for the first time and was given five sprayings, the result being that this year the orchard yielded 4600 barrels which were marketed for nearly $6000. After the other apples were picked, the apples on the ground were sold for forty cents a hundred.

Grant Dishon has about fifty acres of orchard near Troy. In 1910 he got $2000 for the apples. In 1911 there was a good bloom, but the apples were so wormy that most of them fell off and enough was not realized to pay expenses of picking. In 1912 he sprayed four times and all the apples, except about ten acres he failed to spray the fourth time, ran about ninety per cent No. 1 apples. He got $5000 for his crop.

Joe Hagenbuch this year had a good set of fruit on 225 of 600 trees near Troy, and received $1000 for his crop. The best previous income from the orchard was $365.

In 1911 the orchard of Geo. T. Groh, at Wathena, produced 750 bushels of bulk apples. In 1912 it was sprayed three times, and in spite of the fact it was hit so hard by hail that it looked at the time like a total loss and spraying was for that reason stopped, the orchard produced 4200 bushels of sound fruit and 2000 bushels of bulk. A few days before the hail, a buyer went through the orchard and estimated that ninety per cent of the fruit would be sound.

Adam Groh sprayed, and he and Geo. T. Groh sold their fruit to Mike Bauer, jr., for $3700 this year. They had 1100 trees. Mr. Bauer also bought the crop this year from the Drosselmeier orchard of 900 trees for $275.80. The orchards were of the same age, practically, adjacent and both hit by the same hailstorm, but, as Mike Bauer says, "Not by the same worms," for the Drosselmeier orchard was not sprayed. This difference so impressed Mr. Bauer that he leased the Drosselmeier orchard for five years. With the Cushman power sprayer he received this week, he will spray thoroughly, doing dormant spraying this winter for scale.

The result of the increased returns from sprayed orchards has been an awakening to the necessity of spraying. Sprayed fruit not only

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brought better prices, but was more easily disposed of, while those who did not spray found it hard to sell their apples at a good price, and in many cases were forced to sell them at a sacrifice. Several more orchardists are planning to purchase spraying outfits, and in the future to consider the orchard something more than a by-product.

EDWIN SNYDER: I would like to ask the professor about the spraying material recommended by the Agricultural College.

PROFESSOR MERRILL: We use for the first spraying 2 pounds of arsenate of lead, a gallon and a half of lime-sulphur to 50 gallons of water. Second spraying, two pounds arsenate of lead and one and one-half gallons of lime-sulphur. Third spraying, same proportions, and this time we are a little more careful in applying it; applying lime and sulphur during warm weather is liable to burn the foliage. We will not use Bordeaux mixture when it looks like rain. Use lime and sulphur the third time, holding the foliage back and allowing the spray to go on as mist. The fourth spraying would be arsenate of lead plus Bordeaux, and fifth, if we suspected blotch, would be the same thing, or if you do not suspect blotch just arsenate of lead.

HOW THE GOVERNMENT EXPERIMENTS HAVE HELPED GROWERS IN SOUTHERN KANSAS.

By W. D. MCCOMAS, Superintendent Thomas Orchards, Wichita.

The apple-growing industry in southern Kansas is of great importance, and something we can well be proud of, for the beautiful apples produced in the valleys of this section have a far-reaching fame. The splendid results of government experimental work, coming at a time when help and encouragement were greatly needed, have created new faith and enthusiasm among fruit growers here, and we hope in future to produce fruit that will give our fertile district the credit it justly deserves.

A few years ago some of the older orchards became badly infested with fungous diseases and growers were at a loss to know what to do. It was disheartening after years of hard labor, of tending and waiting, to find the trees fast becoming worthless, the fruit blemished by disease, and unfit for use. Growers of the old reliable Missouri Pippin and Ben Davis were particularly discouraged. Many were about to condemn these varieties.

But through the government experiments they learned that by thorough spraying at the right time with the proper remedies old trees of these kinds would produce nice clean fruit of more desirable color than the young trees did before they became infested.

The old orchards are being rejuvenated, cleaned up and cultivated. The man with a small home orchard on the farm takes pride in the beautiful apples he can again raise on his trees. He has learned from experience that it is impossible to grow such fruit without spraying, pruning and cultivating.

The treatment for most of the fungous diseases and insects is in the form of spraying. Great variation is possible in regard to the thoroughness with which the work may be done. Often the material and equipment

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selected are the proper kinds, and the time of work according to schedule, but owing to a little carelessness on the part of the operator in making applications, all labor may be lost and the grower discouraged. Failure among the inexperienced engenders lack of faith in the treatment. But when they see the results of the government experimental work, knowing the condition of the fruit in previous years, growers can not fail to realize that the diseases and insects can be controlled. That by a little inquiry they can find where mistakes were made, and start in the next year with renewed determination to conquer the pests.

Doubtless there are many engaged in apple growing who could have greater measure of success along some other line of activity. The fact that we are fortunate in having soil, climate and location excellently suited to fruit raising, together with reports of large profits per acre in the business, have induced men to engage in it who are neither adapted nor educated to the fruit-growing industry.

They put out orchards, and when fungi and insect pests attack the trees, make no attempt to overcome these difficulties, thinking the work and expense too great, and so fail in the original undertaking. Spraying with the commercial orchardists in southern Kansas is beyond experimentation. They have demonstrated to the apple world that they can "produce the goods." And we certainly appreciate the assistance we have received from the national government and state in the betterment of our fruit industry.

The following officers were elected for the ensuing two years:

President, J. T. Tredway, La Harpe; Vice President, B. F. Smith, Lawrence; Secretary, Walter Wellhouse, Topeka; Treasurer, Edwin Snyder, Topeka.

Trustees: Second district, B. F. Pancoast, Iola; Fourth district, C. C. Cook, Eskridge; Sixth district, J. J. Alexander, Norton; Eighth district, F. E. Wickham, Wichita.

ORCHARD IRRIGATION.

By Sheridan Ploughe, Hutchinson.

In the early days of Reno county the pioneer boomers continually talked of the "underflow" in the Arkansas valley as one of its greatest resources. They pointed out that the water ran under the ground on a level with the water in the Arkansas river; that the supply was inexhaustible, as it had its source in the melted snows of the mountains. They argued that with the water only six to ten feet under the soil it would become an ideal farming and fruit-growing country.

These men talked more wisely than they knew. They thought only of the closeness of water to the top of the ground as a means of raising crops. It was before the days of gasoline engines, electric motors and other cheap power machines. The time for the utilization of that vast supply of water did not come for many years after, and its benefit has only just begun. The time is not many years off when every man who wants to stay in the orchard or garden business in the Arkansas valley

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will have an irrigation outfit on his place. If he does n't he will be left to trail along in the apple business, as the man who profits by nature's bounty in that valley, the man who successfully competes with his neighbor, will be the man with a rotary pump, a series of wells on his place, a gasoline engine or electric motor.

The average rainfall for the past thirty years in Reno county is 29.6 inches per year. It is entirely enough, if properly distributed, to mature any crop. But the only trouble is in the distribution. For instance, 1911 will long be remembered as the dryest year many of us ever saw in Kansas, during the growing months, yet the difference in rainfall for the last eleven months of that year and the present year was only 4.74 inches. In 1912 we have had an exceedingly bountiful year. The rainfall for the eleven months past amounts to 27.16 inches, while for the same period last year the rainfall was 22.42 inches. The trouble last year was the small rainfall during the growing months of May, June, July and August. In 1911, for the months mentioned, the total rainfall at Hutchinson was 8.83 inches, while for those months in 1912 the total rainfall was 14.12 inches. The difference, 5.29 inches, is the difference between the apple crop of 1911 and that of 1912. The one a year of small amount and almost unsalable fruit, the other a year with trees bearing almost their full capacity of the highest grade of fruit.

But even in 1912 it paid to irrigate. Some very practical illustrations were found in the orchards of Reno county. One orchard that I know of personally, for I bought the crop from that orchard, was that of Judge H. Whiteside. He has a fine orchard, properly sprayed and trimmed and cultivated. This year he irrigated his orchard. He sowed and I reaped. As fine apples as I have ever seen came from his trees—very large, very highly colored, sound and hard. In looking over his orchard before buying, I counted but little on the Missouri Pippins. They were small then (October 5), and I did not think they would grow much more, nor add much in color. We left them until the last to pick, not finishing until November 2. But the irrigation of July and August showed here. The apples grew larger instead of falling as they usually do. They got redder and redder, and larger, until some of the finest Pippins I ever saw were gathered from that orchard. The percentage of No. 1's was raised from our estimate made early in October from 15 to 20 per cent to over 60 per cent, and the number of bushels harvested was then twice what would have been taken from the trees had they had no water pumped on them.

It counts up rapidly to increase the size of the apple. Increase an apple from 2 inches in diameter to 2¼ inches and the capacity of that apple to fill up the box at picking time is increased 27½ per cent. Add another quarter of an inch to the apple and you have added 67 per cent to the capacity of that apple to fill up your box. You have raised the grade of the apple in the first instance from a cull to a choice; in the latter instance from a choice to a fancy; you have increased the value by the first increase from 20 cents a bushel to 50 cents, and when you add the last quarter of an inch you have added another 50 cents to the value of your box of apples. You have done more than this, you have decreased the price per pushel of picking and packing. It takes longer to pick, and much longer to pack properly, a 2¼-inch apple than it does the apple that

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runs over 2½ inches in diameter. Your troubles of selling your fruit decrease inversely as the square of the diameter of your apple increases. A fancy apple sells itself, but it takes salesmanship of the highest order to get your price for the cheaper grade of goods.

There is no year but what an artificial supply of water will help. July and August drain the resources of the trees. The growing apple demands moisture, and the leaves pump to their full capacity to supply this demand. The roots are taxed to supply the demand of the fruit and the leaves. If there is only enough water in the soil to keep the leaves growing, the fruit will stop growing and fall off; but if the water is supplied, the leaves perform their function and the fruit continues to grow, it will be the difference between having an orchard that barely pays for its existence and the one that returns a revenue that is commensurate with the investment that an orchard represents.

The additional cost of an irrigating plant to that which is already invested in land and labor in an orchard is a very small item. A well in our county costs about $60 to sink. It is made by putting a galvanized-iron casing two feet in diameter down into the ground. Thirty to thirty-two feet of this pipe are used. It is from six to twelve feet to water. To successfully irrigate, there must be a sufficient volume of water to supply the pump. Eighteen to twenty-four feet of water in the 32-foot pipe will supply a rotary pump with a 4-inch suction and a 3-inch discharge pipe It will require a 5-horsepower gasoline engine to run one of these pumps. It will require five gallons of gasoline every ten hours to keep the engine running. So the cost of pumping will be about 7 cents an hour for gasoline, and lubricating oil and waste will hardly increase the cost to ten cents per hour. Such an outfit will pump you 250 to 400 gallons per minute, depending on the distance the water has to be lifted. With one well we have that is used to irrigate cabbage, potatoes, tomatoes, and other garden produce, the lift of the water is about 6 feet. This well is the oldest on the place, gets better every year, as the pumping of the water is constantly drawing the fine sand from the ground around the pipe, leaving coarse gravel close to the pipes, and this makes a reservoir of water outside the pipe that increases the capacity of this well. This well yields 400 gallons of water per minute, with a 5-horsepower gasoline engine.

But if you should only get 200 gallons of water per minute, the cost of irrigating an orchard is so small that you can not figure it into the cost of your apples. In our upland orchard, where we raise the water from 18 to 20 feet, the kind of plant I have described will irrigate 50 to 60 trees a day so that it will be impossible to walk over the ground without sinking to your shoe tops. It will take one man to run your engine and lay out the furrows and watch the water in the ditches, perhaps a total cost for ten hours, gasoline, man and horse, of three dollars, or about 5 cents a tree. After the ground is thoroughly soaked, the ground should be harrowed to hold the moisture in the ground. Repeat this operation, all that will be necessary in nine years out of ten, and you will spend about ten cents per tree per year, less than the cost of one spraying; and take it one year with another, you can easily count on a 30 per cent

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increase in the volume of your fruit, and in exceptionally dry years it will be the difference between a crop that barely pays for handling and one that pays a dividend on your investment.

What is the cost of an outfit such as has been described? Each well will cost $50 to $60, depending on the nature of the soil that you encounter in digging out the ground in your galvanized pipe; a gasoline engine will cost about $350; a pump will cost $50 to $60; other expenses will put the cost of one well and engine at about $500. What can be irrigated from one well? That, of course, depends on the lay of the land. In an orchard there should be one well for every 10 to 15 acres of trees, as the loss of handling the water by evaporation and by over-soaking some parts and under-wetting other parts will easily pay for putting down an additional well. With a mounted engine it is but a half hour's work to pull the suction pipe and move the pump to another well.

If it is possible to do so, electric motors can very profitably be used instead of gasoline engines. Electric lines are being strung over the country so that we expect to substitute motors for engines, as a 5-horsepower motor costs only $75, as against $350 for the same power gasoline engine. This will leave our engine to be used in places where we can't have access to electric wires. But where no electric lines are run, the mounted gasoline engine is the power to use.

Gentlemen, if you can get the water, if you can get it either from a stream or from the ground, don't wait until next July to think about irrigating. You don't wait till the fire starts to insure your property. An irrigating outfit, where water is available, is the best insurance you can put on your orchard. The added cost, considering what you have already invested, is so small that as an investment it will not only pay for itself each year, but will add a big per cent of revenue to the entire investment of orchard, irrigation plant and all. It bridges over the dry months, when the copper-hued sky refuses to yield the needed moisture, and when the scorching sun withers and curls the leaves on the trees. Some years it will be in great demand, other years it will be of little use. Yet having it you are independent of rainfall, and when the dry years do come you will have a crop and your neighbors will look at your trees, see the apples hanging on, getting bigger and redder every day while their apples have dried up and fallen from the tree, and then you will see that the man with an irrigation outfit will go down to his house justified, rather than the man who did not protect his orchard this way.

DOCTOR BOHRER: I want to verify what the gentleman's paper has advised. A number of years ago I was on the board of managers of the State Soldier's Home at Fort Dodge. Vegetables could not be raised there without irrigation, and the appropriation voted by the state legislature was not sufficient to warrant an attempt to irrigate vegetables for the inmates of that home. I was on the point of recommending the removal of the home elsewhere in the state unless we could bring water to the surface. With the approval of the other members, we put up a 12-foot windmill and sunk a well. With this irrigation they raised an immense amount of vegetables, everything for use of the inmates of that home. It was necessary later to enlarge this plant. Then the two other members

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wanted us to get a centrifugal pump. We got a small engine—only, perhaps, 5- or 10-horsepower, and it threw a stream of water three inches in diameter. You could n't exhaust that supply of water at all.

ORCHARD SOIL MANAGEMENT.

By Prof. S. A. Beach, Ames, Iowa.

THE OUTLOOK.

In taking up the subject of Orchard Soil Management we have before us a question that pertains to the most important fruit which is grown on the American continent. Corn is called king of our farm crops. By the same standard the apple is queen of our fruits. The amount of capital which is represented in American apple-orchard investments, together with the cost of labor and materials employed in growing the crop, putting it upon the market, caring for the orchards, and in the manufacture and handling of the various apple by-products, aggregates a money value which far exceeds that represented by all other American orchard fruits combined.

THE OUTLOOK FOR APPLE GROWING.

No one is disposed to put money into any particular system of orchard management unless he has some confidence in his ability to get it back again. First of all, then, let us take up a brief consideration of the reasons why, as apple growers, we have ground for confidence in the future of this line of crop production.

One of the good reasons for feeling confident in the present and future of the apple-growing business, where it is well located and rightly managed, is that there was never a time in the history of this country when there were so many people ready to pay from $2 to $5 a box for apples of good grade and good quality as to-day. Their number is continually growing. The United States is increasing rapidly in wealth and population, and therefore in its capacity to consume good fruit at prices remunerative to the grower. It is estimated that within the next forty years our population will pass the 200,000,000 mark. Think for a moment what that means with reference to the annual home demand for orchard products. If there is any young man here who has in mind looking out for some permanent investment along agricultural lines, permit me to emphasize this point of view for his particular benefit. An orchard rightly located and properly handled is still in good condition at the end of forty years. Therefore, let me repeat the statement that this country is expected to pass the 200,000,000 mark in population within the next forty years!

Besides this rapid increase in our home-market demand for apples, there must be taken into consideration the contemporaneous expansion of our foreign trade. Who is there here who will attempt to forecast the magnitude of that development? Every year brings all parts of the earth closer together, counting nearness or separation by the time and expense of intercommunication. So I believe the outlook for a continually increasing market demand for good apples justifies the statement.

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that we have before us a proposition that is worthy of our best thought when we take up the consideration of one of the most important orchard subjects, namely, that of the right management of orchard soils.

SOIL MANAGEMENT FOR APPLE ORCHARDS.

Shall we manage orchard soils from the standpoint of what will give the best returns when used as a pasture or feed lot for calves and colts and hogs and sheep, or from the standpoint of what kind of management will give the best returns in apples? I propose in this discussion to take the point of view that the best crop to grow in the orchard is apples, and that the best thing to expect from the orchard is the bearing of regular and abundant crops of fruit by vigorous, healthy and long-lived trees, and I shall leave each individual to decide according to his predominant purpose of farm management such questions of expediency as whether to use the orchard for a hog lot or for a range for poultry or sheep or calves, or to handle it purely from the standpoint of apple production.

Looking at the tree with a view to arriving at some sensible philosophy as to its processes of life and growth, notice first that it stands with its trunk and branches in the air, and its roots in the soil. In the air the leaves spread out in the sunlight to catch the rays of the sun, so that as they receive the food materials from the soil in the sap which comes up through the trunk they may, with the help of the energy of the sun's rays, build these crude food substances into organic foods, such as sugar, starch and protein compounds, which the tree must have to support its life, to maintain its growth and to produce its crops of leaves and fruit.

The roots in the soil, what do they need? We have just had a splendid paper by Mr. Ploughe demonstrating to us conclusively that they must have plenty of water to do their best work. In fact it may be said that they can not do without water because nature has so managed the menu for the apple tree that all its courses are soup courses, and no matter how much fertility may be present in the soil, unless water is there to dissolve it, the apple tree will starve in the very midst of plenty. So it must have water. I will not impose on you by trying to drill that fact in. We will assume this audience accepts it without question.

The next point I wish to mention is one the importance of which is not generally realized, and that is that the roots of orchard trees must have air. If apple growers fully realized this there would be at once a wonderful revolution in their practice as to orchard management. These roots can not carry on their vital activities without air any more than we can. Exclude air from the roots, as is done when the soil is covered or filled with stagnant water, and what happens? Ask your corn crop. How quickly corn leaves turn yellow when stagnant water fills the soil and excludes air from the roots! The deeper the air can get into the soil the deeper can the roots work and proportionately greater is the amount of plant food that is available. Among the scientific investigations which establish this fact are the studies in soil bacteriology, which show that those microörganisms which are working over food materials in the soil and putting them into shape in which the plants can use them are more abundant where they have plenty of air and

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moisture. The deeper the air can get into the soil the deeper an abundance of these microörganisms is found. To a certain extent the bacterial life of the soil, that is to say, the abundance of the bacterial flora of the soil is a good indication as to whether soil conditions are favorable for the support of apple roots and of other roots. I shall recur to this subject later.

Another soil factor which is important is that of temperature. In some of our apple-growing regions the soil is too cool and in others it is too warm for best results with apples. The way in which the soil is managed may have some little influence on soil temperatures. As we shall see later, experiments show that under a system of so-called sod mulch as compared with tillage, during the summer season, the soil temperature is warmer at morning and at night in the cultivated area than it is in the sod area. It is so at a depth of six inches, it is still more so at a depth of twelve inches. It is an advantage, then, to have orchard land well tilled, not only because it destroys weeds, not only because it conserves moisture, not only because it tends to favor permeation of soil by air, but also because it tends to a more even and favorable temperature of the soil for the roots to work in. In some apple-growing regions there is need of growing shade crops during the hottest parts of the season to cover the soil in order to get the best temperatures and prevent the soil from getting too hot for the best growth of the roots. This is being done in some portions of Colorado and other irrigated regions of the West.

We can see at once how impossible it is to lay down exact rules for every detail of orchard management, regardless of where the orchard is located. What may be right for one locality may not be good for another. Every man, therefore, must study the principles which underlie orchard soil management and adapt the application of them to his own particular conditions and location.

SOD MULCH VERSUS TILLAGE.

Generally speaking neither orchardists nor experiment station men are recommending the practice of continuous tillage without cover crops, or shade crops, or green manuring of some kind. Therefore it goes without saying that when the term tillage is used with reference to a system of orchard management it is supposed to include the use of cover crops or their equivalent. What has been said and written in discussion of the merits of tillage as compared with the sod-mulch system of managing orchard soils up to the present time consists for the most only of expressions of opinions. An examination of all this mass of material would show that in the last analysis these opinions very seldom rest back upon exact experiments. This is not saying that such opinions are not worthy of consideration. In many cases they are, because they are based upon thoughtful observations continued through long years of practical experience; but after all they do not have the force, nor do they carry the conviction which attaches to the results of exact experiments carefully worked out.

It has been my privilege to originate and help carry forward two very important series of experiments bearing on this question of the com-

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parative merits of the sod-mulch and tillage methods of orchard management and the value of humus in orchard soils.

TEN-YEAR TEST OF ORCHARD TILLAGE AS COMPARED WITH SOD, IN NEW YORK.

The first was started in 1903, in an orchard belonging to W. D. Auchter of South Greece, about seven miles northwest of Rochester, N. Y., in the midst of one of the best apple-growing regions of the world. I know Mr. Auchter very well. In fact, two years before this experiment was started he had a conference with me regarding the best way to handle this particular orchard. He soon afterward bought it and began to adopt what would be called some of the more modern methods of orchard management. This orchard, which had been planted in 1877, was then about twenty-five years old. Up to 1903 it had been so unproductive that Mr. Auchter was able to buy it at practically the price of ordinary farm land. For many years it had been in tough old sod. He immediately put it under cultivation as I had recommended. The result was that the next season he got a crop of apples which brought him about $2000. The following year, 1903, I arranged with him for a ten-year lease for the New York State Experiment Station of Geneva, with which I was then connected, and put the orchard under a ten-year experiment for the purpose of comparing the sod-mulch with the tillage method of management. There were at that time a great many orchardists in New York state, and also in adjoining states, who were fooling themselves with the idea that the best way to handle their commercial apple orchards was to keep them in sod. Some were advising the sod-mulch method of cutting the grass annually and letting it rot on the soil as a mulch.

After starting this experiment and carrying it forward for three years, I resigned the work in this orchard to my successor at the New York Experiment Station, Professor U. P. Hedrick. Able reports have been made by Professor Hedrick and his associates in the Geneva Station bulletins, and in reports to horticultural societies and periodicals, from which I have freely drawn in presenting to you some of the results of this work. Before setting forth these data it may be of interest to this audience to give a statement concerning the conditions under which this orchard has been grown.

The orchard was selected for the experiment because of the uniformity of the trees and of topography and soil. It has good natural drainage, yet is so nearly level that it does not wash when under cultivation. There is not more than 15 feet difference in elevation between the highest and lowest points in the orchard. The soil is a Dunkirk sandy loam, with about 5 to 10 per cent clay to a depth of 9 or 10 inches. The subsoil below that is a fine, compact sand, getting coarser as the depth increases.

The trees are planted 40 feet apart. All, with a few exceptions, are of the Baldwin variety. There are 26 trees in a row and 10 rows in the orchard. This makes the orchard of oblong shape.

Five rows were put under tillage, followed about the first of August with a cover crop of either mammoth red clover or oats, and the other five rows were seeded to blue grass, timothy and orchard grass. The orchard grass has taken the ground so completely that the sod is now principally orchard grass. The orchard grass grew very heavy. It would

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have made, perhaps, two tons of hay to the acre if it had been made into hay; but it was cut every year and allowed to drop back onto the ground. One year it was photographed, showing the orchard grass when it was ready to cut, standing as high as the front wheels of a buggy. This shows that the soil was capable of growing good grass; as a matter of fact it was possible to get good sod-mulch conditions there.

The following tabular statement shows the total expense and the net income for the period from 1904 to 1908.

Year.	Fertilizer.		Mow-Cultivat.		Pruning.		Spraying.	
	Sod.	Tillage.	Sod.	Tillage.	Sod.	Tillage.	Sod.	Tillage.
1904.....	$15.05	$15.05	$19.99	$38.75	$14.625	$14.625	$58.225	$58.225
1905.....	18.60	18.60	7.46	48.71	13.25	13.25	44.27	44.27
1906.....	17.00	17.00	3.36	30.30	15.12	15.12	46.51	46.51
1907.....	8.37	8.37	3.67	46.63	15.33	18.31	73.84	73.84
1908.....	.....	.....	6.14	36.67	16.865	22.125	50.45	50.45
Totals....	$59.02	$59.02	$40.62	$196.06	$75.19	$83.41	$273.295	$273.295

Year.	Harvesting.		Total expense.		Net income.	
	Sod.	Tillage.	Sod.	Tillage.	Sod.	Tillage.
1904.....	$219.25	$210.90	$327.14	$332.55	$225.76	$185.34
1905.....	82 89	96.85	165.47	221.68	330.28	255.60
1906.....	104.30	231 80	186.29	340.73	154.96	392.42
1907.....	138.07	224.20	139 28	371.35	487.16	800.31
1908.....	173 43	338.59	246.885	447.815	353 865	723.415
Totals....	$717 94	$1,102.34	$1.166.065	$1,714.125	$1.552.025	$2,457.085

The average annual net income per acre on the basis of 27.2 trees is $71.52 for the sod plot, and $110.43 for the tillage plot; a difference of $38.91 per acre, or an average annual increase of 54 per cent in favor of tillage.

The average annual yield for the five years was 72.9 barrels per acre for the sod plot, and 109.2 for the tillage plot, a difference of 36.3 barrels, or 108.9 bushels per acre annually. This is an increase of about 50 per cent in favor of tillage, and runs closely parallel with the increase in net income.

An actual count of some first-grade fruit from each plot showed an average of 434 apples per barrel from sod and 309 from tillage, and an average weight per apple of 5.01 ounces from sod and 7.04 ounces from tillage. In Hedrick's opinion, this ratio of 5 to 7 is fairly indicative of the average difference in size of the fruit from the two plots.

In one respect the sod fruit was generally superior, and that was in being more highly colored. This varied with different seasons. The sod fruit also showed the less scald in cold storage late in the season.

The tillage fruit grew longer, ripened later, and in common storage kept about a month later than the sod fruit. In quality it was more juicy, crisper and better flavored that the sod fruit.

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The tillage trees made the better growth. The average gain per tree in trunk diameter for the five year period was 1.1 inches for sod and 2.1 inches for tillage, a gain of 1 inch or 100 per cent in favor of tillage.

The foliage of the tilled trees was more abundant and of a darker green color. The leaves were distinctly larger. They came out three or four days earlier and remained on the trees a week or more later than the foliage of the sod trees.

The length of twig growth averaged 3.4 inches annually for sod and 6.7 inches for tillage. The number of branches or spurs coming on these twigs and small limbs averaged 1.9 per year for sod and 4.4 per year for tillage. During the winter the wood on the tillage plot had a plumper and brighter appearance than on the sod plot, and this was noticeable a long distance off.

The roots came closer to the surface in the sod than in the tillage plot. Through the growing season the tilled soil was warmer than the sod, at a depth of 6 inches, by 1.1 degrees F. in the morning and 1.7 degrees at night; and at a depth of 12 inches, by 2.3 degrees in the morning and 1.8 degrees at night. The average for one July, at a depth of 1 foot, was 55 degrees for sod and 67 degrees for tillage, which in this case is doubtless in favor of tillage as giving the better temperature for root growth.

SOME REASONS WHY TILLAGE IS BETTER THAN SOD FOR THE APPLE.

What are some of the reasons for these results? In western New York, where this experiment is being conducted, the apple trees are most apt to suffer for lack of soil moisture in the summer season. Drouth may begin as early as June, and more or less extended periods of dry weather are almost sure to occur sometime during July and August. The trees then have their growth checked by reason of thirst. When growth is once checked it takes some little time to start it again, even after the conditions become favorable. When the rains return after such a drouth the apple tree does not make the same uniform, steady, firm growth it would have made if it had had a continuous and abundant supply of soil moisture, as every nurseryman knows who has cultivated apples in the nursery row.

In 1907 and 1908, 120 determinations were made of soil moisture in this orchard during July and August, as measured in terms of tons per acre for one foot in depth of soil. These showed about 104 tons per acre foot in sod and 167 tons for tillage, an increase of 60 per cent in favor of tillage during those important months. Notice that this is not far from the percentage of increase in annual net income for tillage over sod for the five-year period.

SOIL TEMPERATURE.

It has already been noted that another factor of fundamental importance in the growth and action of the roots is temperature. The records show an average during July of 67 degrees at a depth of 1 foot. This is 2 degrees higher than the average for the sod, and in this case the difference shows the better growing conditions under tillage.

HUMUS.

It has been stated by some that the tillage method results in a decrease of humus; that the humus is "burned out," so to speak. What is humus? No one yet has been able to tell exactly. It is not just vegetable matter

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turned under, but when such vegetable matter breaks down into a friable condition it becomes in part humus. Manure is not humus, but manure changes to humus as it decays. Humus improves the soil in respect to aëration, in respect to moisture-holding capacity, and in respect to increasing the number of micro-organisms which, as is well known, perform an important function in breaking down the manure and vegetable matter in the soil into forms which the roots can absorb as plant food.

Surprising as it may seem, analyses showed an increase of humus for tillage as compared with the sod-mulch plat. For the first 6 inches of soil there was found, in July and August, 2.2 per cent of humus for sod and 2.4 per cent for tillage, an increase of 0.2 per cent for tillage. This signifies a gain equivalent to 1.8 tons of humus per acre. Note that the first year the yield of fruit was rather in favor of sod treatment; in fact, we purposely gave every apparent advantage to the sod plot in laying out the experiment. But after the first year the tables turned, the tillage plot took the lead and has held it ever since.

About three years ago, for the sake of meeting some criticisms which were being made, the plan of the plats was changed. In the first plan the orchard was divided lengthwise into two equal plots. By the change in plan it was divided crosswise into two equal plots, thus putting one-fourth which had been in sod under tillage, and one-fourth which had been in tillage into sod. The results have not yet been published, but it is reported that they show that the part which was in sod and is now in tillage is coming up in productiveness and growth of trees to the standard of the old tillage plot, while the other fourth which was under tillage but is now in sod is going back all the while towards the standard of yield and of growth which obtain in the old sod plot.

TEN-YEAR TEST OF TILLAGE VERSUS SOD IN IOWA.

The other experiment to which I referred is located about four miles east of Council Bluffs, Iowa, on soil of the Missouri loess formation. Since becoming connected with the Iowa Experiment Station I have succeeded in establishing this orchard soil experiment in an orchard leased for ten years, as was done with the New York experiment. The work is carried forward jointly by the departments of horticulture and soils, the horticultural work being in the immediate charge of Laurenz Green, of our station staff. This orchard covers about twenty-three acres, but there are only about eighteen acres of trees now left in the orchard. It contains a number of varieties. Those under test are Gano, Arkansas or Mammoth Black Twig, Winesap, Grimes Golden and Northwestern Greening.

The main purpose of this experiment is to observe the effect on the tree of varying the amount of humus in the soil, and to see if there is any correlation between the amount of humus in the soil and the varied activities of the tree, its longevity, its vigor, and its productiveness. To this end the orchard is divided into plots some of which are tilled thoroughly during the growing season, then the last of July or first of August seeded with some cover crop, to be turned under again the next spring. Other plots are cultivated all the time, being kept perfectly clean, and with no cover crop. Others are in clover sod; others in blue grass. By these different lines of treatment the amount of humus is varied in the different plots.

The results thus far obtained are in line with those found in the New

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York experiments. Already, under cultivation, there is an increase in productiveness and in the size of the fruit, thus giving us a better grade of fruit, although not yet to so marked a degree as that obtained by Mr. Ploughe with irrigation. Note, however, that the progress is right along the same line, indicating that a reliable supply of moisture to the roots is correlated with increase in the size of the fruit. The station took possession of this orchard in the summer of 1910, too late to get any results that season. The crop of 1911 yielded about 1700 bushels; that of 1912 about 3400 bushels. The 1912 crop attracted much attention because the yield of other orchards in that vicinity was very light.

Some very interesting things are being worked out by our soil bacteriologist in connection with this experiment at Council Bluffs. In the bacteriological analyses of this soil it is being found that while the bacteria are most numerous in the first few inches of the soil and gradually become less as the depth increases, there is still an appreciable number of them as far down as fifteen feet, which is as deep as samples were taken. How much farther they extend has not yet been determined. This is what is known as Missouri loess soil. It is of such a nature that air and roots penetrate it to a very great depth. This is the same kind of soil that is found bordering the Missouri in Iowa, Nebraska, Kansas and western Missouri. It is one of the best fruit soils found on the globe. Partly because of this fact, the time will doubtless come when northeast Kansas, southwest Iowa, southeast Nebraska and northwest Missouri will become famous the world over for their fruit products.

Following is a statement showing the relative numbers of bacteria found at different depths in the Council Bluffs experiment orchard, which is located on this Missouri loess type of soil, as compared with the numbers found at Ames, in central Iowa, on a Wisconsin drift type of soil, which is heavier, less porous and not aërated so deeply nor so thoroughly as the Missouri loess soil. It should be noted that the moisture content of the two soils was not very different and that the Wisconsin drift soil was much better supplied with humus. It is clear that with better aëration of soil there is here found much better growth of bacteria.

The counts of bacteria here given show the average of four determinations for the loess soil and the average of two determinations for the Wisconsin drift.

Are there not places in Kansas where it would pay to give more attention to the drainage, not alone for the purpose of getting rid of surplus water, but also to better aërate the soil, so as to make it a more comfortable place for roots to live in, and particularly so for orchard trees from which regular crops are desired? When it gets uncomfortable in any place for a man he can move, but the tree is anchored; it must stay where it is the year round and through all the years of its life. If stagnant water comes and shuts out the air from its roots it can do nothing but suffer from asphyxiation and drop enough of its leaves to adjust itself as best it can to the unfavorable conditions. If the orchard is to do good work its roots must be in comfortable condition through all the year, and not only for a few days at a time. They must not suffer from either too much water, nor from thirst, nor from the lack of a needful supply of air. We have

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BACTERIA AS AN INDEX OF SOIL AERATION.*

Depth of sampling.	Bacteria per gram of air-dry soil.		Depth of sampling.	Bacteria per gram of air-dry soil.	
	Missouri loess.	Wisconsin drift.		Missouri loess.	Wisconsin drift.
4 inches	4,414,000	1,752,000	90 inches	12,200	
8 inches	2,261,000	1,248,250	96 inches	9,700	
12 inches	822,500	546,000	102 inches	8,000	
16 inches	571,500	298,250	108 inches	6,650	
20 inches	337,500	153,500	114 inches	5,500	
24 inches	281,000	93,850	120 inches	3,650	
30 inches	240,000	48,500	126 inches	3,200	
36 inches	218,500	31,600	132 inches	2,170	
42 inches	208,000		138 inches	1,700	
48 inches	151,500		144 inches	1,310	
54 inches	62,500		150 inches	940	
60 inches	44,500		156 inches	600	
66 inches	31,360		162 inches	347	
72 inches	25,500		168 inches	311	
78 inches	20,250		174 inches	276	
84 inches	14,950		180 inches	244	

* Brown, P. E., Iowa Exp. Sta., Research Bull. 8, 1912, 289, 314.

seen that proper attention to such matters as those in the New York experiments was repaid by profitable crops and improved condition of the trees. Some of the data obtained in this work are given in the following paragraphs. They show the advantage of holding moisture in the soil by tillage and cover crops, as compared with the cheaper, easier, but less profitable method of sod mulch.

One of the best indications of whether or not trees are making good growth is the measure of the girth of the trunk of a tree, because it shows how much new wood the tree is laying on. During a five-year period the trees in sod laid on 1.1 inches and the tillage trees 2.1 inches—a difference of about 100 per cent gain for the five years in favor of tillage.

From all that has been said, it appears that in the management of soils for apple orchards it will be profitable to give more attention than has been given, first, to the conservation of a continuous supply of soil moisture, so that the trees may better withstand any periods of drouth that may come, whether it be in spring, summer, autumn or winter; second, to securing more constant and deeper aëration of the soil, so that the rootlets may always find favorable conditions for carrying on their vital activities.

A MEMBER: I would like to ask a question. It has been thoroughly impressed on my own mind that it would be better to cultivate my orchard. I have been cutting grass and weeds and letting them fall, and also cover crop, as you suggest; and the question comes up about spraying. They must be sprayed. I suppose you would say we must tile so as to haul the sprayer around?

PROFESSOR BEACH: No, sir. I would tile to let the air get to the roots. We have had no trouble, since tiling a wet orchard, in hauling a heavy sprayer around the field; but I believe I would tile, so as to get larger root capacity for our trees.

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Another thing I would like to mention, if I can take just a moment. I believe if a man is going to produce better apples he must look well to the soil to get his money back.

VICE PRESIDENT TREDWAY: Give us your opinion as to depth.

PROFESSOR BEACH: I would put the tile 3½ feet deep. You will not see the most benefit the first year, or the second year if it is a heavy subsoil, but gradually you will see the benefit.

A MEMBER: What size tile?

PROFESSOR BEACH: I don't like to use anything less than four-inch.

A. H. GRIESA: In regard to tiling, I have done considerable of it. I don't know how much tile it takes. My land is quite similar to that around Tonganoxie. I could plow around one end of my tree rows and at the other water was standing. I didn't like it. I put tile through the whole of it, and there is no water standing there now. Drains were put 33 feet apart, one between each row of apple trees, and near my house I put them even farther apart. The very first year I could see the benefit of it. The tile can be bought for $3 a hundred at our brick yard. In regard to the size of the tiling, I made one end of the orchard 4-inch tile and the other I made 3-inch. I think it paid right along from the very first. I think it does pay to tile land in Kansas.

PROFESSOR BEACH: Answering the question about the size of tile. Up in our part of the country we are using 4-inch tile, because in some cases if there happens to be a little depression in the tiling a little silt will get in.

MR. BROOKE: I can back that up by saying that farmers who were putting in 3-inch tile, I understand, are taking them out and putting in 4-inch. While I am on the floor, Mr. Chairman, I want to say that I have been very much interested in the professor's talk. It has been a question with me and some of my friends what Kansas orchards will produce if properly tended. We have illustrations here of what can be produced. I have an orchard which bore its Winesaps for the first time this year, and if I had not been bothered with dry weather, taking care of my stock, I could have picked 90 per cent of those Winesaps as No. 1's, but I want to say that there is a little orchard of five acres northwest if this place that has not been tiled and has not been well tilled and sprayed and cared for, and I do not believe that this society has a record of it. If it has not I want to give the record, and that is that orchard two years ago produced $5600 worth of apples, and that gentleman cleared $3800 on his five acres, $760 an acre. I was there the evening he picked his first day's picking and he was picking York Imperials. I asked him what his trees produced. He said he picked thirty-four bushels and packed 31 bushels of No. 1 apples off the tree. What would that orchard have done if it had been properly cared for, the trees had been properly sprayed and taken care of? It simply shows the possibility of northeastern Kansas, and I think, and I have always said, that there is the best ground in this country, best possible. Northeast Kansas, northwestern Missouri, southwest Iowa and southeastern Nebraska can not be equalled any place else in the world, and it is up to us, gentlemen, that are located in that princely country, that valuable orchard country, to make it produce its very best. I have fully made up my mind that I will

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never pay storage on a worthless apple any more. I will never put in cold storage anything but No. 1 fruit. I would sooner feed them to the hogs or make cider of them. It is the worthless apple that is depressing the market all the time. If we can dispose of that worthless stuff and put it into cider then we will get a fair price for our apples.

MR. SNYDER: I have been very much interested in this excellent lecture. It is very instructive.

IMPROVING THE MARKET CONDITIONS FOR HORTICULTURAL PRODUCTS.

By GEO. O. GREENE, Manhattan.

There seems to be plenty of opportunity to improve the horticultural market conditions. Some of the methods by which they might be improved are well known to all of us. Every year at our annual meeting some one endeavors to explain to us a few of the better methods by which we can reach the public with our products. We all heartily agree that much can be done by better cultural, picking, packing and grading methods, to say nothing about the application of the simplest of business methods in the marketing of our fruits and produce. Sometimes we even hail an especially good paper on the subject as coming from a second Daniel, and then we go home and join in the good old horticultural anthem, "As it was in the Beginning, so it ever shall be," and in the singing our ardor becomes cooled and we persuade ourselves that Dan was a faker after all, and that the prophet who buys our apples, "orchard run," at 40 cents per hundred and sells them to our wife's sister, who still lives in the city, at $8 per barrel, is the true and only exalted high priest of the horticultural realm. The average run of fruit growers will not cease to worship the false god who says "Barrel them," nor will the packing table and the apple grade laws cease to put terror and resentment into his soul. When you talk advertising to a disciple of the old school, he forthwith begins to laugh about the clown, the three-ring act, the fat lady and the "before and after taking," yet he goes to the corner store and buys some corn flakes to match the advertisement he has seen in the *Ladies' Home Journal,* and likewise buys a hat to match the one depicted in the catalogue on top of a very handsome young man. Though he does these things, he does not think that he can take the ideas home to himself. He does not seem to understand that what he is doing is the very thing that his neighbor has already done. He takes the train to go visiting. The day is warm and he does not believe in drinking ice-cold water, and especially not in view of the fact that in Kansas he would have to buy a drinking cup. So when the newsboy comes through with some cute little funnels filled with a half-cent's worth of grapes, our friend gladly produces a dime with which to quench his thirst. He goes home and forthwith forgets to apply some such method to his own system of selling. He still sticks to the selling of the whole orchard for a grand, sweet song, or else he packs them in the good old-fashioned, bunglesome barrel of his forefathers, sweetly warbling the while out of tune, "It's the old time method, and it's good enough for me."

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In spite of the fact that most commission men would rather buy a three-bushel barrel of apples at $1.50 than to buy three bushel boxes at $1 each, and in spite of the inactive condition of some orchardists' minds and bodies, the small package has come to stay. The wholesale market will take it, the retailer is glad to see it, and the consumer, who is the supreme court in such things, takes off his hat and opens his purse to it. Some reactionaries won't believe it, a few progressives are studying over it, and the leaders are packing in the smaller package and making money thereby.

I sometimes tell the farmer growers whom I meet in traveling over the state that they don't know the meaning of the phrase "market demand." They don't know, in the first place, what class of people buy their stuff. They don't know whether it is by the nickel's worth or by the tub full. They don't know whether the consumer would rather have a barrel, a small box, a bag, or a basket with a convenient handle for carrying. They don't even want to tell the consumer who grew and packed the stuff so he will be able to procure the same thing the next time he goes marketing. The producers of other foodstuffs spend thousands of dollars in educating the market to call for a particular brand, the brand being the only difference between that and any other brand. They even hire men to work out the style of package best adapted to fit the delivery basket, the market basket or your wife's egg case, if you are fortunate enough to be able to take an egg case to the store when you go. We don't know anything about styles in packages, and we don't care, just so we can find a buyer who will come into the orchard and take our apples, "orchard run," and pay us two or three hundred dollars for 1500 or 2000 bushels of really good apples and thereby give us the time to make another losing bet with weather and chinch bugs on seven-and-a-half dollars-an-acre wheat. If we would hedge a little and bet each year that we would lose our wheat, we would be ahead in the end.

To improve the market conditions we have first to improve and make over our market methods. The real market for horticultural products is better than ever before in the history of the country. The grower of these products is satisfied with less than ever before in the same length of time. Our main trouble right now comes from the fact that we keep as far as we can from the real market, and we manage in some manner to back off a little farther each year. Our very souls are stirred and we buck, balk and pitch when any one suggests to us that we sell in the market. We are determined to sell to the prosperous-looking individual who comes to our orchard with two or three good cigars and a good roll of cash. We are willing to present him with all of the profit and a good deal of our labor for the pleasure of his acquaintance. It is so much easier, even if there is a good deal less money in it for us. Then, if we sell in a rational manner we don't have a good story to tell our neighbors of the big deal that we made nor how the commission man has robbed us of our sustenance. Our very laziness has made the commission man and the broker not only possible, but necessary. According to our present methods of marketing, it is the most correct and cheapest method of getting our products to the consumer. The fact that the commission man

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buys at 60 cents per hundredweight and sells at $8 per barrel redounds to his credit as a business man, and, by the same token, the fact that we have let him do it for the last ten years also indicates, on our part, a not too close study of business methods, of distribution, and of the ultimate market to which we send our products. As I have said, our very inactivity has made necessary the broker and the commission man. We have opened the way for great opportunities in that line. These opportunities have attracted so many to that sort of work that some system of association and coöperation became necessary for their own protection; so we have the apple shippers' associations, the commission men's leagues, fruit jobbers' associations, and other similar methods of coöperation to advance the interests of that particular brand of brotherhood. Through the efforts of these associations you have been legislated out of the cities as far as selling out of car doors is concerned. A few years ago a light crop was reported all over America. The commission men and buyers went to Canada and bought everything in sight. They all, individually and collectively, got stung. This showed them that an exact and concise report of the condition of fruit all over the country was necessary to their very good welfare. They now compile such a report. They know ahead of time somewhere near the exact amount of a given product for any season. They know. You estimate the world accordingly as you have much or little. If you have a fine crop you are sure that the world also has a fine crop and that your fruit is not worth much. When my friend the broker tells you that he bought a hundred cars of better fruit than yours at half what you are asking, and tells you how great big red apples are sweeping the ground in seven or eight states, you are happy to think he is truthful and has your welfare at heart. You hasten to close with him before he changes his mind. You take time to regret your haste in December when you read the market report on apples. He also has other artful methods for parting you and your crop with as little outlay of cash as possible.

I have the greatest of admiration for the man who invented the relay method of buying apples and other horticultural products. By this method a large territory can be covered by three or four men in one employ. One goes through the territory offering from 10 to 30 per cent of the real value of the crop, and is, of course, turned down. A second man arrives a few days later and is anxious to buy. He asks Mr. Farmer if he has had an offer on his fruit. The farmer is willing to admit the fact. He then naturally asks what the figures were, and as a usual thing gets the information. It is then the buyer's turn to inform, which he does by saying that the price is higher than he can afford to pay. Usually this second man is also sent on. By the time a third man comes along the grower hastens to close the deal before he is fined for owning a few old apple trees.

All of these things go to show what can be accomplished in the way of coöperation and a little market knowledge, especially so where the other fellow can not or will not coöperate nor study the market and up-to-date market methods. It is true that all men who grow fruit for the market are not business men, nor can they have a clear business understanding

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of market methods. Yet there are many who can pack in uniform packages and can stick to some one or two particular methods of packing. They can also stick to one commission man whom they have found to be honest.

If our growers would pack uniformly and honestly and use even the simplest methods of advertising their products, we would hear much less criticism of the market and market prices. Every man who grows fruit for the market should grow good fruit. We should use the best cultural methods known. We hear many arguments for the lazy man's method of seeding the orchard down to grass, where either hay is produced or stock graze the grass into the ground. This method takes from the soil two crops without the addition of more food, where only one crop was supposed to be produced. We hear many tales of trees producing small and inferior fruits as they grow older. We usually horrify these old-time owners when we suggest the feeding of the crop and giving it good, clean culture. Our fruit crops are the most abused crops on record. We expect to grow fruit worth $500 an acre with no investment or culture or labor after the trees are set. If we would spend 4 per cent of the crop in culture and spraying we could grow good fruit. We spend cheerfully 20 per cent of the crop to grow 40-bushel corn. When we realize that the average corn crop for Shawnee county is less than 26 bushels, we are spending about 25 per cent of the crop for culture and seed. When we consider, too, that 50 per cent of the apples this year in orchards that had no care were unfit for the market, and that the wholesale price now for the poorest grade of marketable Ben Davis is close around $1 per bushel box, it should appeal to every orchardist, from a purely business standpoint of dollars and cents, to grow better fruits.

If we would take into consideration that our wife's sister, living in the city, is paying from 60 cents to 75 cents per peck for not any too good a grade of apples, we ought to be planning a method of educating her to call for our characteristic packing and packages. If she and her neighbors know that our peck or half-bushel package, with its picture of a big red apple smilingly reposing on a big, bright green leaf, stands for the best that there is to be had in fruits, she will call for that package, and perhaps you can, if you are a good advertiser, make the children cry for it. If she reads the ticket inside the package, which says that you will refund her for every unsatisfactory package that comes to her with the seal unbroken, you have gained her confidence. She will walk a few extra blocks to get your package, even if your label stands for a little higher price. She becomes a valuable advertising medium for you among her friends, increasing the demand for your products. A stroll through the grocery stores throughout the cities will convince you that we don't have one-half enough good fruit to go around, and that there are not one-thousandth enough good individual packages. There will never be half enough good fruit to supply the demand that we have for the best. The buyer of our products supplies as many as he can of those who want the best, but by the time the fruit gets to your wife's sister it has been culled over so many times that she must pay the top price for very poor quality.

The buyers of horticultural products have for a long time been instructing us in the fine arts, and the wonderful results to be obtained by a sys-

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tematic method of coöperation, and by the use of careful methods of grading and packing. We are the most inapt students in the world, and we obstinately refuse to listen to any such revolutionary teachings. Most of us can see the advantages which implement men, Coal Oil Johnnies and Nicotine Brodies have received through coöperation. We, all of us, realize the advantages that come to us through the coöperation of the different states in one big confederation. We can't see that the same methods are necessary to our very existence, to say nothing about price and profit. The fruit growers up at Troy, Kan., were long-headed enough to see this. Every year since they formed their association they have doubled their acreage of berries, and instead of cutting down their orchards, as they started to do prior to their organization, they are now planting more. They have considerably more than doubled the price they received for their fruits prior to their forming the association, and are now able to market all of their crops, instead of selling a part at a low figure and losing all of the remainder. The orange growers of California have increased their output from 4000 cars in 1893, which did not pay the freight charges, to 28,000 cars in 1911, which averaged them, net, $1.85 per box.

Something like 300 growers of our own state have realized the value of the coöperation of the Agricultural College in finding a market for their apples this year. We did not call it coöperation, but named it the "Clearing House." Coöperation is a terrible word. That the extension department of the College found a market for 800 or 1000 cars of fruit with an outlay of $60 for postage stamps and no particular experience or information to begin with, and absolutely no authority to urge the growers to follow up the leads furnished them, nor to act on our instructions in any way, shows what can be accomplished. If you get sick, hire a doctor. If you don't know how to market your stuff, get your neighbors to help you to hire a man who does know. I would like to see every fruit grower who grows fruit for the market a member of some good fruit growers' association. He will have to join such an association if he expects to stay in the business, unless he is able to reach the more exclusive markets. Even the "Hill Billies" and the "Scissor Bills" of Arkansas are ten years ahead of us in this particular. They have a big central association and many auxiliary associations, with very competent men at the head of each.

The extension department of the Agricultural College has been working along this line, and some good results have been accomplished in the way of starting associations. We are always glad to hear from the fruit growers, and a letter will bring any desired help.

I want to show you how easy it is for any community to advertise. We simply sent notices to the daily papers of what we expected to do in the way of finding a market for fruit. The daily papers all over this country took it up. The eastern papers were very glad to print them. They thought it was something in the right direction, and we got many letters from growers all around. In less than a week we had telegrams from all over the United States from apple buyers wanting to get in touch with growers. Since we sent out letters to the growers and buyers we got many letters from both sides and some of them are very flattering letters. The president likes to tell the story of a man who was hunting

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for a car of fancy Jonathans and wrote to the College. The same day a letter or telegram came in from a man in the same community wanting to sell a car of fancy Jonathans. As a matter of fact these two men were three miles apart, and by noon one man had bought the apples and the other had sold them. We kept a card catalogue of growers, and whether they had first-class or just orchard-run stuff. We could have brought many more buyers into this state than we did if we could have found first-class stuff.

MRS. BULLARD: I want to express my gratitude, though possibly no one in the building at this moment can appreciate it, in regard to "relay" buyers. Husband and myself have been victims in years gone by of the relay buyers, and I hope that we may have these selling organizations all over Kansas. One of the things that is interesting just along this line, a matter that has proven interesting to husband and myself, is the matter of common storage, and we have one with us to-day who has had a great deal of valuable experience and who constructed a common storage this year, Mr. Dyer, from Emporia, and I would like very much for him to give his experience. I think it is quite valuable to all of the farmers who are interested in dry storage.

R. V. DYER: Some one is to blame for this imposition on this society. I remember several years ago, along in July or August, having a paper, "Puck," which published a little statement running like this:

"Now the honest farmer
Is packing apples for town,
And this size at the top of the barrel
And these are farther down."

My experience is somewhat limited, and yet I know you can always sell good stuff at a good price. At the present time I am working on a problem of getting good stuff out of poor conditions, and I am not going to brag about it. We have had a little success and a whole lot of failure. We have some good apples and there are a great many poor ones. I am selling my good stuff from $1 to $1.50 per box in the town of Emporia without any trouble, and I have many, many bushels that I am offering at 25, 35, 45 cents a box, and my neighbors turn up their noses and pass on.

The first problem is to grow a good apple. It is absolutely useless to try to market a poor apple at any time.

The question of storage is quite simple. In dry storage there will always be a certain amount of shrinkage, from the fact that the apple ripens more rapidly than in cooler temperature. However, there are a number of advantages, especially where you market in a local way. Your stock is where you can watch it; can work with it every day. The sorting may be done later than the picking. You deliver to customers a sound package at the time of delivery. Usually the apples hold up under normal temperatures and the fruit will go into store or family and last a reasonable length of time. The house constructed this year is one of my own idea. Formerly we built one of cement. In that location we had plenty of sand, but at the orchard where I am now working it is difficult to get and a long distance to haul. This forced me to substitute a 15 feet high, pitch roof, 28 feet wide, 32 feet long; 10 feet above the floor we put in

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a second floor, and this is used as a loft for building boxes, as they come in knocked down. The outside of the entire building, both roof and sides, is covered with paper. The sides are further reinforced by 2- and 2½-inch bats in order to get a little body on it; we painted them white, and put on 4-inch corner boards. It makes a very pretty combination of black and white. The stoarge room proper in this building occupies the east end of the building, which runs east and west. The storage room proper is 10 feet high, 28 feet wide, and about 22 or 24 feet in length. It has only one opening, and that is inside of the packing room; the remaining distance is used as packing room with sorting tables. The storage room is provided with two windows and good wide ventilators, three openings through the floor. I have been able to keep Jonathans in very firm condition up to this time (December 20). My Winesaps are sound and firm yet. Of course, an apple will not grow any larger in storage than it does on the tree.

This building cost me a little less than four hundred dollars, and I can put in it nearly 2000 boxes of apples; in addition the packing room will hold possibly four or five hundred boxes, and in the loft above I have room to store made-up boxes and making equipment for nearly three thousand boxes, giving us capacity to handle a carload of boxes in very nice condition.

PROF. S. A. BEACH: May I ask the construction of the outside walls to make them frost proof.

R. V. DYER: Two by fours sheeted with 1-inch material for the inside wall, and the same construction for the outside, that gives us a four-inch dead-air space in both ceiling and floor and inside the walls. During the daytime, in warm weather, we ordinarily keep the door shut and that makes an absolutely dark room. My experience is that sound apples will keep; immature apple and those affected with blotch or blight will rapidly go down. However, I can say this to those who are interested. That illustration was used when I was a boy, that one bad apple on a plate of apples would make every other apple on the plate go down. Ordinarily, with this storage, each apple has no effect on the apple next to it. I have been able to pick out all of my sound fruit from the spoiled. The shrinkage will be larger than cold storage. Against that you have the fact of having your crop under your own observation, and you can have it absolutely clean at the time of delivery to your customers, and the shrinkage is not very heavy.

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THIRD DAY—Morning Session.

Called to order by President Tredway.

PRODUCTION AND DISTRIBUTION.

By EDWIN SNYDER, Topeka.

The last sixty years has witnessed the most wonderful increase in the productive capacity of labor, due to the invention and use of improved machinery and appliances. A boy of thirteen or fourteen, guiding a team hitched to a mower or binder, will do the work which sixty years ago required ten strong men to do, with the appliances of that day, and do it incomparably better. All other lines of production have been correspondingly increased and cheapened by the use of improved machinery. While this is true of production, distribution or machinery of commerce has in no wise been cheapened, but is as expensive as it was 2000 years ago. It seems to me that the problem which confronts the political economist of to-day is the cheapening of distribution as production has been cheapened. I can not but believe that the intelligence of this twentieth century is equal to the solution of the problem. The Hon. Park Goodwin, more than seventy-five years ago, writing of distribution of commerce, said: "Commerce is designed to bring the producer and consumer into relation; that is, if it has any object. But in itself it produces nothing; it adds nothing to the commodities which it circulated. It is obviously, then, for the general interest to reduce commercial agents to the smallest numbers, and to carry over the excess to some productive employment."

In our societies, precisely the contrary takes place; the agents of commerce are multiplied beyond measure; designed only to play a subordinate part, they have usurped the highest rank; they absorb the largest portion of the common dividend, out of all manner of proportion to the services they render; they hold the producer in a servile dependence; they reduce to its lowest terms the wages of workmen, and they extort from the consumer without mercy.

Blind competition, so much boasted of by the political economists, has largely contributed to the evil. Traffickers, in consequence of it, give themselves up to a regular war against each other, and in order that they may not be beaten they are ready to resort to any expedient; in short, they deceive in every way, and defraud at all seasons; yet commerce, in our corrupted societies, is the most certain way of arriving at fortune, honor and distinction.

The true distinction is here taken; commerce is essential, since each can not advantageously produce all that is required to satisfy his wants, but it is not necessary nor desirable that commerce should appropriate the grist and leave only the toll to production.

I write in the fullness of a great apple harvest; apples were never so plentiful nor of such fine quality as this season. Good windfall apples have

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been advertised as low as 10 cents per bushel at the orchard, within six or seven miles of Topeka, while in the city they were retailing at from 20 to 50 cents per peck, an average of probably eight or ten times what the producer received for them; many bushels were doubtless fed to swine, while the poor of Topeka seldom had what they wanted of this healthful fruit. Of the picked winter apples, the bulk of which was marketed to dealers, I doubt if the producer received, on an average, more than 25 cents per bushel. The ultimate consumer, this winter or next spring, will pay $2 per bushel, or eight times what the producer received for them. A friend of mine, who raises a few apples on his farm as a side issue, concluded to take them to a packer in his near-by town. He paid $11 for picking, hauled the proceeds of the work to town, and it brought him exactly $11. Thus he raised the fruit and hauled it to market for nothing. It is needless to say he did not market any more that way; said it would be cheaper to let them rot on the ground. A negro, for some misdemeanor, was ridden on a rail; they jumped him up and down and gave him a very rough ride, and then asked him how he liked it. He replied: "Well, gentlemen, if it was not for the honah of it, I believe I just as soon walk." Doubtless this farmer, if it was not for the honor of being a fruit grower, would as soon have followed some other line of husbandry.

A market house, where producer and consumer can meet on common ground and do business without the intervention of go-betweens, to the mutual advantage of each, would largely solve the problem of local distribution. The much larger one of general distribution can only be solved by a comprehensive plan of coöperation. That coöperation is feasible and practical is abundantly proven by the history of the Rochdale Society of Equitable Pioneers. More than seventy-five years have passed since a dozen poor weavers met in the back room of a poor inn in Rochdale, England, to discuss means of bettering their conditions. (See Greeley's Political Economy.) Unionism, strikes and kindred topics were discussed without concluding that any of these would afford them any substantial relief. At length one of their number spoke to this effect: If we can not get better wages, let us adopt some plan by which we can make our wages go farther. After further discussion they organized what they called the Rochdale Society of Equitable Pioneers. Each was to pay into the treasury the sum of twenty pence per week to form a working capital. Not all were able to comply at the time, and a year elapsed before they had acquired a capital of $140 with which to begin business. They rented and fitted up a room in Toad Lane, laid in a supply of necessaries such as their families needed, and began business. Skeptics stood around to scoff and jeer, but the Pioneers minded their own business and let the heathen rage. At first the store was opened only nights, and the members took turns tending store. Such was the humble beginning of a coöperative enterprise which has spread over nearly all England, been continuously prosperous, and greatly blessed its members. It has millions of capital invested in many stores. It buys grain by the cargo, to be ground in its own mills for its members. It buys refrigerated meats from the United States and Australia by the cargo also, to be retailed from their many shops. Their plan of business was simply to

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handle only good, substantial goods; to buy and sell for cash only; to pay 6 per cent on capital stock. Of the net profits 2½ per cent went to the support of libraries and reading rooms; the balance of the net profits were divided among the members in proportion to their trade. The success of the Pioneers induced many imitations on the Continent and in this country. A few in this country have succeeded and been abundantly profitable to their members. Most of them have failed because of mismanagement and the iniquity of the credit system. Cash payment is the essential element of successful coöperation; and the concern that sells on time will find it is selling on eternity, with many of its creditors setting off for the ends of the earth, leaving their more thrifty associates to struggle vainly against a flood tide of adversity which must ultimately bear them down. The difficulty of starting coöperative enterprises in this country is because the recompense of labor is more liberal here than in the Old World, and the necessity of planning and scheming to save dimes and make each dollar go as far as possible is consequently less urgent in America than in the Old World. Of coöperative selling I shall have less to say. The growers of citrous fruits in California have found it very profitable, as have the growers of cantaloupes at Rocky Ford, Colo., and the peach growers in Georgia. The small-fruit growers of Doniphan county, Kansas, have been very successful in coöperative marketing of their products. Some fifteen years ago some large cattle growers of Texas organized the American Live Stock Commission Company. The coöperative concern did a very profitable business for a few years. Finally it took in various farmer organizations of Kansas and did business for them. It was doing too much business to suit the Kansas City Live Stock Exchange, which is a conspiracy in restraint of trade, and for the purpose of preventing competition in the sale of live stock. They decreed the American Live Stock Commission Company should quit business, and by certain iniquitous proceedings, which I shall not stop here to discuss, they enforced their decree. I have faith that an extensive and beneficent plan of coöperative selling of farm products will yet be made plain to those who seek, not selfish personal advantage, but the highest and widest public good.

I can not forbear to speak further of the iniquitous competitive system of business. It has resulted in a very locust horde of go-betweens who infest the commercial field (I use the term "infest" advisedly; it is just what I mean). At least two-thirds of the go-betweens could be dispensed with. They are useless, redundant, just so many parasites upon the body politic. "They toil not, neither do they spin; yet Solomon in all his glory was not arrayed like one of these." I have no quarrel with the numerous wholesalers, jobbers, commission men, agents, retailers and commercial travelers who crowd the commercial field any more than I have with the old scythe and cradle which the mower and binder have superseded. I simply say that the intelligence of our advanced civilization should be equal to the problem of dismissing three-fourths of this vast army of exchangers from trade to some industrial production. At present we are employing them to do business for us, and must pay them for their services whatever they demand. I understand there are about

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100,000 commercial travelers in the United States. They increase the cost of goods they handle to the extent of their salaries and expenses. They are the direct outgrowth of the competitive system of business, and are utterly useless. Suppose these gentlemen could be dismissed from distribution to some form of productive industry; the result would be greatly beneficial to the country, in that a large element in the high cost of living would thereby be dispensed with.

I am an optimist. I believe the world grows better year by year, and that at some time the present relentless, destructive competitive system of business will be superseded by beneficent peaceful coöperation.

HORTICULTURE IN THE SCHOOLS.

By Prof. Chas. H. Withington, Topeka.

I am not going to offer you any new suggestions in your work, but I do hope to interest you in the study of horticulture and agriculture in our schools.

Horticulture and agriculture as a study in the schools is comparatively new, not having been introduced into this country until 1890, when it was introduced in Massachusetts by the Massachusetts Horticultural Society.

Kansas City, Kan., to-day claims to lead the cities of the world in utilizing vacant lots and land for garden purposes. They even utilize the right of way of the different railroads in Kansas City. No rent is paid for the land; people who live near simply spade it up and plant gardens. The railroads do not interfere.

Kansas City claims to have 2000 acres within its own limits in garden plots, or 900 square feet of cultivated garden for every home in the city. Why can not Topeka do as much?

This garden work was introduced in our own schools for the first time last spring.

A small plot 6 x 10 feet was used at each school to demonstrate the preparation of the ground, the time and depth of planting different seeds, and the care of the plants when up. This we find more practical and economical in the saving of both time and money than the large vacant-lot school gardens.

As long as agriculture is an optional course in the schools you can not exact very much manual labor from the pupils of this course; if you do you will soon find yourself minus pupils, for the boys and girls of to-day are like the boys and girls of yesterday—most of them go to school to graduate, so they may go to college or enter some profession.

Agriculture as a scientific or professional work is new, and the old belief that any one could farm or garden who is not capable of doing anything else is hard to overcome.

As an incentive to put the study into actual practice at home, last year Topeka gave a number of prizes to the pupils of the graded schools who would compete in the work. As a result, out of the 1500-odd pupils from the fifth to the eighth grades, inclusive, who entered the home garden

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classes, 19 per cent made their first gardens. Of these 262 exhibited products from their gardens at the school contest in September, with a total of 778 entries. While this seems to be a very small per cent of the number of gardens made in the spring, it does not necessarily mean there were only 262 who made a success. Those who planted early vegetables only, like lettuce, radishes, peas, etc., and did not practice rotation of crops, did not have any thing to exhibit in September. At the school exhibit, pupils who had made gardens but did not exhibit on account of not planting their gardens right seemed to see their mistakes and were interested in plans for next year so they might exhibit at the contest.

The financial returns of the different gardens were rather varied. The highest reported for any school garden was 34 cents per square yard.

Home gardening for the boy or girl is putting into practical use the study of horticulture and agriculture. It cultivates the habits of industry and thrift, helps the boy to help himself, reduces the cost of living for the family, for the money usually paid out to the groceryman for vegetables can be paid to their own children, and they will be sure of fresh vegetables besides.

It is the best type of nature study, because it brings the pupils into direct contact with nature. Gardening requires the study of the soil, both as to composition and texture, bringing into practical use chemistry. The preparatioin of the soil for the different kinds of plants, bringing into practice the study of the different fertilizers, and how and when to apply them. Next comes the time and manner of planting, which involves seed testing, and the importance of securing the best seeds to get the best results. Also here can be introduced the different ways of plant propagation, as seeds, bulbs, root division, cuttings, etc.

The study of the different plants or vegetables, and the length of time it takes them to develop or mature, enables them to practice crop rotation. To get the best results from a small plot of ground, intensive gardening must be used. This brings them in contact with insect enemies and how to combat them.

In planning and laying out their gardens, landscape gardening, in a measure, can be introduced, for the variation in the habits, growth, form and color of the plants and foliage of the vegetable world is almost as varied as those of the floral. The asparagus can be used as an ornamental plant as well as a vegetable; also the pieplant, with its long red stems and tropical-looking leaves. And what is prettier than the curly parsley for a border?

It teaches a practical method of bookkeeping, because the problems are real and personal. It develops individuality, it trains in the habit of carefulness, it keeps the child at home, it makes him realize fully property rights, and, best of all, it tends especially to beautify the home, and consequently the city.

It is said Topeka expends an average of fifty cents for mowing weeds on each vacant lot. If Topeka really wants a more beautiful city, why not use some of this money as prizes to encourage vacant-lot gardening, as there must be something to stimulate the interest of this work in the boys and girls of Topeka while they are learning to realize the financial possibilities from a well planned and kept garden?

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MARKET GARDENING FOR PROFIT.

By CHARLES P. RUDE, North Topeka.

This is a large subject. I will try only to set forth what I think to be the main features.

Good seeds planted at the proper time, and on soil as nearly adapted to each crop and variety as possible. We must have good seeds and to get them have to learn largely by experience. A reputable dealer at home should be patronized, for he is more likely to have seeds adapted to his location than the "eastern man," but some new varieties can and should be obtained from the originator.

Planting at the proper time. This is a large factor with gardeners, especially in the spring. The first sales of vegetables of all kinds bring the best prices, and some will depreciate to a mere fraction in a few days.

Soil adapted to each crop and variety. Now we may have good seeds and plant just right, but if it is not the right kind of soil the results may be poor. Some crops demand a rich soil, others do not; for instance, cabbage wants a rich not too light a soil; sweet potatoes a light soil and the poorest we have; early tomatoes a rich soil, later or larger vining types a thinner one; early beets a rich loam, late ones a thinner and sandy soil; radishes, except for first early, do not require a rich soil. Other well-known crops such as egg plant, squash, beans, peas, asparagus, rhubarb, onions, turnips, carrots and parsnips will stand a high degree of fertilization. Fertilizer in the form of stable manure can be had for the hauling and should not be neglected.

We all know the value of cultivation, and this is doubly true to the gardener, owing to the tender nature of many crops. I think we could all profitably take lessons from our eastern friends when we see them year after year take more from their "old worn-out" land than Kansas as a whole does from good dirt.

Now comes the main item, for no matter how much we like our work, it takes "dollars and cents" to foot the bills and make profits. The different products, as I stated earlier, must be marketed when ready, and some things in a hurry to avoid a falling market. We can not hold for better prices like the farmer, except a few things such as potatoes, sweet potatoes and late root crops.

I think gardeners here in the West have a great many things to learn in the methods of marketing. It never pays to dispose of inferior goods by mixing with a first-class article. A bushel of potatoes means 60 pounds; a basketful may be almost any amount.

The market wagon, team and driver should have a good appearance and arrange the different articles on the wagon so that all can be seen and taken off as wanted. If it is warm or windy, protect so as to keep fresh.

Every gardener should have a few glass sash for starting early cabbage, tomatoes, etc. Muslin may be used if extra care is given to ventilating and lighting the bed.

Do not try to economize on tools; have plenty of them and see that they are taken care of when not in use.

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OBITUARIES.

NEWEL P. DEMING was born at Ellery, N. Y., August 1, 1826. Died at his home, in Lawrence, July 12, 1912.

Mr. Deming came to Kansas in 1865, and during his life here took an active interest in horticulture. His farm, situated one mile west of Lawrence, was known as Orchard Hill.

L. W. YAGGY, of Hutchinson, died on October 18, 1912, at Watkins Glen, N. Y. Mr. Yaggy came to Hutchinson more than thirty years ago, where he planted a 600-acre apple orchard and 400 acres of catalpas. He was one of the successful commercial horticulturalists of Kansas. He became a life member of this Society in 1901.

W. R. MARTIN,
C. W. MURPHY,
Committee.

RESOLUTIONS.

WHEREAS, We, the Kansas State Horticultural Society, in its forty-sixth annual session assembled, believe that market ills are largely due to poor distribution and lack of appreciation of the value of fruit as food; that quality, poor condition and unreliable packing are causes which operate to lessen consumption; therefore, be it

Resolved, That we urge growers everywhere to raise their standard of excellence, to exercise greater care in grading, and to consider the requirements of the Sultzer bill as low-water mark rather than a high standard to be attained.

Resolved, We urge growers to remember that good fruit is the final product of a large number of factors which must operate for many years before the fruit is produced, and we urge that greater care in soil selection, soil preparation, soil management, pruning, spraying and thinning be substituted for the slipshod methods of the past by many fruit growers.

Resolved, We urge that in addition to correct naming and marking of all packages that effort be made to inform the consumer concerning the quality and uses of varieties.

Resolved, We believe in the principles of coöperation and urge a better and closer association of growers in all their problems of production as well as distribution, and we further believe that the most successful coöperation must recognize the brotherhood of man, includes consumer as well as producer, and that no lasting benefits can come to one at the expense of the other; and that any successful coöperation must consider the rights of every agent in the production and distribution of fruit, from the man who plants the tree to the boy who delivers the goods.

Resolved, We believe that speculation in food products is economically wrong, and that the greed for occasional great profits should be replaced by a system which will insure a just compensation to all concerned.

Resolved, We believe that an accurate knowledge of the cost of food products and their distribution should precede any movement to lessen the cost of living, and that general knowledge of these matters will help greatly in the solution of the problems of living.

GEO. A. BLAIR,
ALBERT DICKENS,
M. E. CHANDLER,
Committee.

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WHEREAS, We, the Kansas State Horticultural Society in its forty-sixth annual session assembled, recognize the especial fitness of President H. J. Waters of the Kansas State Agricultural College for the great responsibility of Secretary of Agriculture of these the United States of America, and believe that his special knowledge of agriculture and its relations to human welfare would enable him to make the department of greater value, not only to those engaged in agricultural activities, but to everyone concerned in useful industry; therefore, be it

Resolved, That we urge his qualifications be carefully considered, for we realize that his value to Kansas should not prevent his greater usefulness to the nation and the world.

REPORT OF COMMITTEE ON EXHIBITS.

We, your Committee on Exhibits, report as follows:

The displays are as follows:

A. L. Brooke, Grantville: One box each of Virginia Beauty and Gano. Premium, $3.

E. G. Hoover, Wichita: One box each of Delicious, Champion and Stayman Winesap. Premium, $4.50.

Geo. A. Blair, Mulvane: One box each of Missouri Pippin and Ben Davis. Premium, $3.

J. Claire, Ozawkie: One plate Fall Queen. Premium, 50 cents.

Frank Weaver, Ozawkie: One plate Babbitt. Premium, 50 cents.

T. P. Van Orsdol, Silver Lake: Seventeen varietes. Premium, $8.50.

T. H. Vories, Wathena: Eighteen varieties. Premium, $9.

J. B. Wheeler, Oskaloosa: Five varieties. Premium, $2.50.

John Cousins, Eskridge: Six varieties. Premium, $3.

A. L. Brooke, Grantville: Two varieties. Premium, $1.

G. Dyer: One variety. Premium, 50 cents.

J. B. Fergus, Kincaid: Twenty-five varieties. Premium, $12.50.

Mrs. J. B. Fergus, Kincaid: One jar apple molasses. Premium, 75 cents.

S. H. Weith, La Harpe: Nineteen varieties. Premium, $9.50

Mark Ard, Elsmore: Four varieties. Premium, $2.

Harry Boeken, Moran: Six varieties. Premium, $3.

D. A. Spafford, Moran: One variety. Premium, 50 cents.

W. F. Weber, Carlyle: One variety. Premium, 50 cents.

W. R. Cone, Hutchinson: Four varieties. Premium, $2.

H J. Hansen. Wichita: Seven varieties. Premium, $3.50.

Sedgwick County Horticultural Society, Wichita: Fourteen varieties. Premium, $7.

F. E. Wickham, Wichita: Nine varieties. Premium, $5.

B. F. Smith, Lawrence: Seven varieties pears. Premium, $5.

T. H. Vories, Wathena: Seven varieties pears. Premium, $5.

Mr. Mauk, Moran: One plate pears. Premium, 75 cents.

The display of apples exhibited by the Department of Entomology of the Kansas State Agricultural College deserves special mention. Their display shows what can be done in the way of handling an orchard by up-to-date methods, and we give to this display the highest award.

F. W. DIXON,
J. M. GRAVES,
O. F. WHITNEY,
Committee.

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PROCEEDINGS

OF THE FORTY-SEVENTH ANNUAL MEETING OF THE KANSAS STATE HORTICULTURAL SOCIETY, HELD AT TOPEKA, KAN., DECEMBER 17, 18 AND 19, 1913.

FIRST DAY—Afternoon Session.

The forty-seventh annual meeting of the Kansas State Horticultural Society convened in Representative Hall, Topeka, Kan., December 17, 1913.

President J. T. Tredway, of La Harpe, called the society to order and introduced Rev. S. S. Estey, pastor of the First Presbyterian church, of Topeka, who led the society in prayer.

PRESIDENT TREDWAY: We deplore very much the absence of our honored and worthy secretary from our presence this afternoon, because of illness; we hope, however, he will be with us for a little while each day.

The first business in order on our program for the afternoon is the reports of trustees for our several districts. I am glad to say that they are nearly all, if not all, present at this time, and we hope that these reports will be full and complete, and that we will learn what is being done throughout the state. We all know what our local conditions are, and the trustees from the several districts will tell us what has been done and what is being done in the several districts.

REPORT FROM THE FIRST DISTRICT.

By W. R. MARTIN, Trustee, Wathena.

Generally speaking the condition of fruit buds in January, 1913, was excellent in the first district, and all remained good until spring, except the apple buds, which were very few on some orchards, especially on those unsprayed. Out of the fifty blanks mailed out only eleven were returned properly filled out. Atchison, Brown, Jackson, Jefferson, Nemaha and Doniphan were the only counties from which we could get a report.

Atchison county: Apple buds in good condition; fifty per cent of a crop set, but later in the summer most all dropped, owing to the hot and dry weather. The strawberry crop was good; cherries and plums were good, and there was a full crop of seedling peaches. Apple trees suffered from the drouth.

Brown county: No apples worth picking; pears 10 per cent of a crop; cherries and plums 75 per cent; blackberries all dried up; raspberries 10 per cent of a crop, and grapes 50 per cent.

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Jackson county: Fruit buds in good condition; there was 75 per cent of a crop of blossoms, and 50 per cent of the fruit set; fifty per cent of the sprayed fruit matured, and only 5 per cent of the unsprayed fruit reached maturity.

Jefferson county: The fruit buds were in poor condition, and there was only 50 per cent of a full bloom; fifty per cent of the fruit hung on the trees and matured; about 25 per cent of a full crop was picked; 90 per cent of a strawberry crop; 50 per cent of raspberries, and about 90 per cent of grapes.

Nemaha county: Fruit buds were in good condition, but there was only about 25 per cent of a full bloom; ten per cent of an apple crop was harvested; 5 per cent of a pear crop; 75 per cent of cherries; 100 per cent of strawberries, and 60 per cent of grapes.

As Doniphan county is my home county, I am in a position to give you a more complete report of it.

Doniphan county marketed 389 cars of apples, or about 64,185 barrels, valued at $208,601.25; 108,863 cases of strawberries at an average price of about $1.55 per crate, valued at $168,737.65; 43,474 cases raspberries at $2.15 per crate, valued at $92,469.10; 53,310 cases blackberries at $1.65, valued at $87,644.50; 153,535 baskets of grapes at 17 cents per basket, valued at $26,100.95. There was also about $25,000 worth of Doniphan county fruit sold in St. Joseph, Mo., which would bring the total sales of Doniphan county up to $608,573.

REPORT FROM THE SECOND DISTRICT.

By B. F. PANCOAST, Trustee, Iola.

I have sent out to members of this society and prominent fruit growers of the second district fifty requests for information in regard to the horticultural condition in their section, which only brought a very few replies, and from those and my own observation I make the following report.

The condition of fruit buds in January, 1913, is reported good, and later in the spring in fair condition. There was a full crop of blossoms on most varieties, but it was a little short on some varieties of peaches. Where spraying was done the crop set well. About 30 per cent of a crop of apples was picked; pears, 30 per cent; peaches, 90 per cent; plums, 50 per cent; cherries, 60 per cent; blackberries, 60 per cent; dewberries, 25 per cent; raspberries, 40 per cent; strawberries, 70 per cent; currants, 15 per cent; grapes, 60 per cent.

Varieties of summer apples averaging best: Early Harvest, Yellow Transparent, Primate, Red June, Duchess, Cooper's Early White, Lowell.

Of autumn apples: Delicious, Wealthy, etc.

Winter apples: Ben Davis, Gano, Stayman, Winesap, York Imperial, Ingram.

Of peaches, Late Crawford, Champion, Elberta, Fitzgerald and Snow seemed to be the favorites. Many varieties of seedling peaches bore good crops of large, fine fruit and are worthy of more extensive propagation.

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Pears: Kieffer, Duchess, Garber and Seckel are leading varieties.

Plums: Wild Goose, Damson, Abundance, Burbank and Red June are all recommended.

Cherries: Early Richmond and Montmorency are in the lead.

Grapes: Moore's Early, Worden, Concord, Niagara and Hicks are good producers. Of the varieties originated by Mr. Munson, of Denison, Tex., the Fern, Bell and the R. W. Munson have proven very productive and desirable in quality.

The codling moth and the curculio have been very destructive, and a large worm commonly known as the tent caterpillar has destroyed the leaves and the fruit on some orchards. Spraying on about 10 per cent of the orchards has been successful in the destruction of the pests, resulting in fair crops, and it is considered a paying proposition. For the past two seasons the planting of fruit trees has not been very great, but is on the increase. The old orchards have gone to destruction so far that new orchards are taking their place. At the present time trees which were not badly injured by the drouth have recovered, and are in fairly good condition for the coming winter. The Ben Davis and Gano were more severely injured by the drouth than any other kinds, the York Imperial enduring the trial best of any. The failure in all kinds of fruit crops this past season can only be attributed to the severely dry and hot weather of July and August. At the present time the outlook is very fair for a crop for next season, but none can predict what trouble may arise for the future.

REPORT FROM THE THIRD DISTRICT.

By F. L. KENOYER, Trustee, Independence.

It seems hardly necessary to make an extended report of fruit yields, prospects and conditions of plantations from southeast Kansas, as a ditto mark after any one of the reports for the last five years would suffice for the present year. We have had the usual drouth intensified by the usual slipshod method of cultivation, or rather lack of cultivation, the absence of spraying and the resultant hordes of cankerworms, webworms. caterpillars, handmaid moths, codling moths, curculios, aphides, bugs and scales, to say nothing of the blights, molds, rots, rusts, scabs, leaf spots and so on, *ad nauseum.*

To the fifty lists of questions sent out to representative fruit growers of the district, I got replies from only ten. Seven of the ten reported the apple crop a failure in their locality; one reported "very few"; one "four bushels where there should have been sixty," and one 25 per cent of a full crop. All reported cankerworms and tent caterpillars very numerous, except one who writes thus about his orchard: "I had a few years ago the largest apple and peach orchard in the county but they never paid expenses, so I fenced my orchard hog tight, and it is the best hog pasture you ever saw. The hogs can lie down in the shade any old time. I like fruit as well as any one, but enough is enough." This man further states that there is no spraying done in his county. Seven report very little spraying and two report that one-half in their locality

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spray. I know a fruit grower who sprayed carefully and thoroughly this year, but did not have any apples, pears, peaches, plums or cherries. The meteorological conditions that prevailed while the fruit was setting caused it to drop. Spraying would probably not have insured a crop of the tree fruits this year, but it would have prevented thousands of trees from being killed outright by cankerworms and tent caterpillars.

A man reporting from Chautauqua county gives this interesting bit of information: "Last March I went into my orchard which had been planted thirteen years. It had never had a knife or saw on any tree. While I did not prune as close as it should have been pruned, I took out all branches that were crossed and all water sprouts. Each wound made I painted with white lead, beef tallow and linseed oil. My orchard, despite dry weather, bore about 40 per cent of a crop of fruit while others that were not trimmed bore from nothing to 5 per cent. Orchards that were not sprayed were completely taken by worms, and no fruit grew at all. About one in five spray. I have had only one tree die this summer out of 150 trees.

The reports on other tree fruits differ but little from that on apples. Five reported the grape crop an entire failure; one 50 per cent; two 75 per cent and two a full crop. These reports were all on the Concord grape as other varieties are but little known. The berry fruits gave a yield of from nothing to 75 per cent.

This is certainly a gloomy picture I have presented, but there is a brighter side to it. The farmers are beginning to awaken to the possibilities of growing more fruits and vegetables for home use. The hardware dealers report the sale of spray pumps and spraying materials on the increase. From present indications there will be more nursery stock set the coming spring than has been set in years. This increasing interest in growing fruits is due largely to the incentive to better methods in farming, which is being fostered by our district and county farm agents or demonstrators. As president of the Montgomery County Farmers' Institute, I am planning, with the coöperation of our farm agent, E. J. Macy, to divide our county into fruit districts, to have the farmers in each district club together and purchase their nursery stock at wholesale, and later to employ some one with a power sprayer to look after the spraying for the entire district. The farm agent will direct the setting, cultivating and pruning of the orchards, while an experienced sprayer will keep the insects and fungi in check. While southeast Kansas is not naturally fitted in soil and climate for extensive fruit growing, there is no reason why the farmers should not grow enough to supply their families with fresh and canned fruits the year round. This will never be done until the above plan is put into effect.

C. A. BLACKMORE: I want to ask a question about this spraying. He said they were in favor of buying power sprayers. How many power sprayers do you think it would take to spray the district?

F. L. KENOYER: It depends on how many farmers could be induced to go into it. A great many would n't go into it. Of course, it is only an experiment.

C. A. BLACKMORE: If you have very many interested of course you would have to send in a great many spraying machines.

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F. L. KENOYER: True, there would have to be more in this district. It will take several years to work up a proposition of this kind, and as more sprayers were needed they would have to be provided.

C. A. BLACKMORE: We used two engines this year, and I think if we had had about two more it would have been an advantage, during the season that the cankerworm, codling moth and curculio were doing their work. I noticed on my place that by delay in spraying a great many of our apples were stung. We did n't get around to it as quickly as we should. You mentioned, in this one orchard of about 150 trees, that but very few trees died. Now, that is practically a young orchard, 13 years old. I have some 12-year-old trees, perhaps 1400 to 1600. If one of those trees died this year I do not know it.

F. L. KENOYER: You sprayed. The farmers that did n't spray lost their trees. The cankerworms defoliated them for three years in succession, and this year it was too dry for them to leaf out again, and that killed the trees. This orchard I spoke about lost only one tree. If it had not been sprayed it would have lost one-third, perhaps. In answering the other question in regard to spraying, I would say that unless some plan of that kind is adopted the farmers had better not set out any trees, in our section anyhow, where cankerworms are so numerous, and the scale will probably get in there. Unless some expert is employed to take the job off the farmers' hands, we will become an alfalfa district; we had better not plant fruit trees.

B. F. PANCOAST: I lost a great many trees. I have my orchard leased to some people, and they sprayed pretty hard this year. They killed all the foliage on the trees. I am anxious to know whether lime and sulphur did n't do a whole lot of it.

PRESIDENT TREDWAY: At the close of the reports it would be well to take that subject up and discuss it.

REPORT FROM THE FOURTH DISTRICT.

By C. C. COOK, Trustee, Eskridge.

LYON COUNTY.

Fruit buds and trees in fair condition January, 1913; good bloom in the spring but few set. About 2 per cent of a crop remained on trees, and 1 per cent was picked. There were no small fruits except a few blackberries and grapes.

Best variety of summer apples, Maiden Blush; winter apples, Jenitons; cherries, Early Richmond; grapes, Concord.

The insects which have damaged the fruit most are the borer and cankerworm. About 30 per cent of the fruit trees are dead. But little spraying was done and it was not very successful.

No fruit trees were planted this year. No interest was taken in horticulture. Trees, vines and bushes are in poor condition to enter the winter. No forest trees were planted this year.

The insect-eating birds nesting with us are blackbirds. We protect them, but they are decreasing. The birds do very little damage to fruit.

The last killing frost was on April 7. First frost September 21.

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Some orchards are nearly dead and all have lost 25 per cent of their trees. One report shows that they sprayed three times with Paris green, blue vitriol and lime, without any result. They would like to know of some better solution to use.

CHASE COUNTY.

The fruit trees and buds were in good condition in January, 1913. The crop of blossoms in the spring was good, and set well. Half of the fruit matured. We picked 75 per cent of a crop of apples, no peaches, plums, pears, or small fruits, except cherries and grapes, of which there was 50 per cent of a crop.

The best summer variety of apples was Early Harvest; winter variety, Winesap; peaches, Heath Cling; pears, Kieffer; cherries, Governor Wood; grapes, Concord.

Cankerworms were bad.

But few fruit trees were planted and very little interest was taken in horticulture. Trees are in fair condition to enter the winter. No fruit trees were planted in the county.

The insect-eating birds with us are quail and sparrows. They are increasing and are protected. They have done no damage to the fruits. The first killing frost was on October 26.

OSAGE COUNTY.

The fruit trees were in good condition in January, 1913, and also in the spring. The crop of blossoms was extra large, but only 1 per cent of the blossoms became fruit. About 3 per cent of the fruit matured.

No apples were picked. Pears, 50 per cent; peaches, 75 per cent; plums, 20 per cent; cherries, 90 per cent; blackberries, 60 per cent; dewberries, 50 per cent; raspberries, 90 per cent; strawberries, none; gooseberries, 80 per cent; currants, none; grapes, 50 per cent.

The best summer varieties of apples were: Maiden Blush, Red June, Early Harvest.

The best winter varieties were: Ben Davis, Jonathan, Grimes Golden, Jeniton, Winesap and Missouri Pippin.

Peaches, Elberta; plums, Wild Goose; pears, Bartlett and Kieffer; cherries; Early Richmond; grapes, Concord.

Blight did much damage to the trees, and caterpillars destroyed much foliage.

No spraying was done, no fruit trees planted, and not much interest taken in horticulture. The trees are not in very good condition to enter the winter.

Birds damaged the fruit to quite an extent.

The first killing frost was on October 16.

GREENWOOD COUNTY.

Condition of buds, trees, and shrubs January, 1913, good. Also good in spring, except the peaches, which were killed in bud. Blooms reported, 20 per cent to a full crop. Amount of fruit set, from 10 to 100 per cent. Amount of fruit matured reported from nothing to 10 per cent.

Per cent of fruit picked: apples, from nothing to 10 per cent; pears, nothing to 50 per cent; peaches, the same; plums, from nothing to 1 per

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cent; cherries, 10 to 90 per cent; blackberries, nothing to 15 per cent; dewberries, nothing to 1 per cent; raspberries, nothing to 3 per cent; gooseberries, nothing to 75 per cent; currants, nothing to 100 per cent; grapes, 10 to 75 per cent.

Best varieties of summer apples: Maiden Blush, Yellow Transparent, Red June, Early Harvest and Gravenstein.

Best winter apples: Ben Davis, Winesap, Jeniton, Jonathan and Grimes Golden.

Peaches: Amsden, Alexander, Heath Cling, Elberta, and Champion.

Pears: Duchess, Bartlett and Kieffer.

Plums: Wild Goose and Burbank.

Cherries: Early Richmond and English Morello.

Grapes: Concord.

No rot or fungi reported. Insect damages: cankerworm took the foliage. Many sprayed and it is considered a success.

Not many trees planted, or much interest taken in horticulture. Not many forest trees planted. Trees are in fair condition for winter. A few birds common to Kansas nest with us, and are increasing. They are protected. They do no damage to the fruit.

Last frost April 15, first frost October 20.

Many trees dead from dry weather.

COFFEY COUNTY.

Trees and buds were in good condition in January, 1913, and in the spring. There was a full crop of bloom, except on the peach. A fair crop of fruit set, and from 10 to 25 per cent of the bloom matured.

Amount of fruit picked, as follows: apples, 10 per cent of a full crop; peaches, none; plums, killed in the bud; blackberries, from none to 100 per cent; dewberries, from none to 100 per cent; raspberries and strawberries, the same; gooseberries, 25 to 100 per cent; currants, none; grapes, 50 to 75 per cent of a crop.

Best summer varieties of apples: Early Harvest, Red June, Red Astrachan, Jeffries, and Maiden Blush.

Best winter apples: Ben Davis, Winesap, Jonathan, Jeniton, and Mammoth Black Twig.

All kind of peaches.

Pears: Bartlett, Kieffer, Garber, Duchess and Seckel.

Plums: Gold, Burbank, Wild Goose, and Marianna.

Cherries: May Duke, Early Richmond, Montmorency and Dyehouse.

Grapes: Concord.

Bitter rot in the apples and blight in the pears are reported. Cankerworms and tent caterpillars stripped the trees of foliage where they were not sprayed. Many are commencing to spray, and if well done is considered effective.

Few fruit trees are being planted. No forest trees are being planted.

Trees, vines and bushes, except strawberries, are in good condition for the winter.

The blackbirds and brown thrush nest with us, and are increasing. We try to protect them. There was no injury to fruit by birds. We consider the apple our surest crop of fruit.

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MARION COUNTY.

Condition of trees and buds in January and spring of 1913 was poor to good. The bloom was poor to heavy. The amount of fruit set was heavy as compared to the bloom.

Twenty per cent of the fruit matured. No apples, peaches, plums or pears picked. Cherries, 20 to 70 per cent; blackberries, none to 60 per cent; raspberries, none to 50 per cent; strawberries, none to 60 per cent; gooseberries, 40 per cent; currants and grapes, none.

Best summer varieties of apples: Early Harvest, Maiden Blush, Yellow Transparent, Red June.

Best winter apples: Jonathan, Winesap, Ben Davis, and York Imperial.

Peaches: Elberta, Stump, and Early Crawford.

Pears: Kieffer and Bartlett.

Cherries: Early Richmond, English Morello, Late Duke, and Dyehouse.

Plums: Burbank, and Wild Goose.

Grapes: Concord, Goethe, and Dracut Amber.

There were depredations of cankerworms and blight. Where trees have been sprayed, no damage was reported by worms. Very few trees are being planted and not much interest in horticulture. No forest trees are being planted.

Most birds common to Kansas nest with us. They are increasing and are protected. Very little damage done to fruit by birds.

Last frost of spring, May 1. First frost in fall, September 23.

MORRIS COUNTY.

The general condition of trees and shrubs in January and the spring of 1913 was good. Amount of blossoms, large. Fruit set as compared with blossoms, good. Per cent of fruit matured and picked, none.

Best varieties of summer apples: Maiden Blush and Red Astrachan.

Best varieties of winter apples: Minkler, McAfee Nonesuch, Pearmain.

Peaches, Elberta; pears, Bartlett; plums, Burbank and Blue Damson; cherries, Early Richmond; grapes, Concord.

Blight and molds injured the trees some. About one-half of the trees in the county were sprayed, and spraying seems to be successful. Not many fruit trees were planted.

More interest than usual was taken in horticulture. Trees, vines and shrubs are in poor condition for the winter on account of the drought. Many forest trees are being planted in the county.

The common insect-eating birds nest with us, but they are not protected. They did no damage to our fruit. Good fruit is in demand at good prices.

WOODSON COUNTY.

The condition of buds and trees in January and the spring of 1913 was fairly good, and the amount of bloom fairly large. The fruit set as compared with amount of bloom was from nothing to 75 per cent. The amount of fruit picked, nothing to 20 per cent of a crop.

Per cent of crop of fruit for the county was: pears, 16; peaches, 25; plums, 5; cherries, 53; blackberries, 10; dewberries and raspberries, from

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none to 12; strawberries, none to 18; gooseberries, none to 42; currants, none; grapes, 50.

Best varieties of summer apples are: Red June, Maiden Blush, and Duchess.

Best varieties of winter apples are: Jonathan, Winesap, Gilpin, Gano, and Black Ben Davis.

Best peaches: Crosby, Elberta, Crawford, and seedlings.

Best pears: Kieffer, Duchess, and Seckel.

Best cherries: Early Richmond, and Early English Morello.

Best grapes: Concord, Moore's Early, and Worden.

Trees, vines and bushes are in poor condition from blight and bitter rot. Caterpillars and cankerworms damaged the crop 90 per cent. Some spraying was done, and is regarded a success if properly done.

Many trees are dead. Some varieties are in good and some in poor condition for the winter. Some peach trees are in bloom. Very few forest trees are planted.

The insect-eating birds common to Kansas nest with us and we protect them. They do very little damage to the fruit.

Date of last frost in spring, 1913, April 10. Date of first killing frost in fall, October 21.

One-fourth of the trees were killed in some localities in old orchards by drouth. It was still dry at Buffalo, Kan., on November 16, 1913.

WABAUNSEE COUNTY.

General condition of trees and buds in January and the spring of 1913 was strong and healthy. The crop of blossoms was extremely heavy. Some varieties had few buds. Crop of fruit set as compared with blossoms was extra good.

Per cent of fruit matured: York Imperial and Winesap, 100 per cent; Jenitons, 100 per cent. York Imperial and Winesap fell off badly, later, on account of dry weather; Jenitons cracked open. All varieties were small.

Per cent of fruit picked: Apples, 25; pears, 10; peaches, 40; plums, 50; cherries, 100; blackberries, none; dewberries, 50; raspberries, none; strawberries, 25; gooseberries, 90; currants, none; grapes, 10.

Best varieties of summer apples: Early Harvest, Red June, Yellow Transparent, Maiden's Blush, Cooper's Early White.

Winter apples: York Imperial, Jonathan and Winesap.

Peaches: Elberta, Crawford, and Late Crosby.

Pears: Bartlett, Duchess and Kieffer.

Plums: Wild Goose, Burbank, and varieties to fertilize.

Cherries: Early Richmond, English Morello, and Dyehouse.

Grapes: Concord, Worden, and Niagara.

Scab did not injure the Missouri Pippins this year. Cankerworms were the destroying insects, but one spraying killed them. Spraying is very limited, but if properly done is a success.

Only one small orchard was planted in this locality. About the usual interest is taken in horticulture. A few are still talking apples. Very few forest trees were planted. All have groves.

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Some trees and vines are in bloom. The maples are in bloom, and I fear for the peach and pear.

All birds common to Kansas nest with us. They are increasing and we protect them. They destroyed the fruit some on account of having no other feed.

Twenty-five per cent of all the fruit trees are dead or damaged to such an extent that they will not serve another year. The last three years have demonstrated that the only varieties which will live on our heavy subsoil are the York Imperial, Jonathan, and Winesap, for they root deeper than other varieties. There are not enough apples to supply home demand. Hundreds of bushels rotted, for they were worthless.

REPORT FROM FIFTH DISTRICT.

By ALBERT DICKENS, Manhattan.

The season of 1913 saw the killing of the peach buds early in January. During the first week the maximum temperature was 45°, and on January 8 we had the minimum temperature for the year, —28°. January 9, —7°, and thawing out on January 10 to a maximum of 36°. Again on the 14th the range of temperature was from 42° in the afternoon to —8° in the morning. After this no live buds were found or reported save in a few localities where seedlings were protected, and throughout the fifth district this condition was quite general. The rainfall record for the year up to date is: January, 0.26; February, 1.90; March, 2.30; April, 3.41; May, 7.18; June, 1.55; July, 0.25; August, 0.65; September, 5.74; October, 2.79; November, 2.37; December, up to and including the 16th, 2.60. Total, 31 inches. The May rain fell all previous to May 20, and the September rain all after September 11, making 111 days during the hottest part of the season with less than 2.5 inches of rain.

Cankerworm was reported in many sections, and was most particularly disastrous in orchards that had been infested the previous season. In some few orchards spray was absolutely inadequate to control the insects, as they were present in great numbers at the very first opening of the cluster buds, and the buds were devoured before the leaves expanded. Orchards that were badly infested in 1912, but well sprayed, showed but little loss.

The lack of moisture from May until September 10, following, as it did, the dry years of 1911 and 1912, was particularly trying to fruit plants and resulted in a short crop. The quality of the fruit in most localities was not above medium. Even where apples were well sprayed, many were scarred by the later broods of the codling moth. In many orchards Ben Davis trees that were affected by black rot, Illinois canker or other fungous diseases were seriously injured and many killed outright.

The demand for apples has in some measure compensated for the short crop, and many growers have signified their intention of replacing the older orchards with new ones. This is particularly true of men who have been supplying local markets and found that a small orchard well cared for is as nearly certain to pay as any line of agricultural effort. As a

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result of the lessons of 1913, it seems probable that most of the tree-fruit growers in the state will invest in one of two machines—either a stump puller or a spray pump.

PERCENTAGE OF FRUIT BY COUNTIES, 1913.

VARIETIES.	Riley	Clay	Dickinson	Morris	Republic	Geary	Ottawa	Washington	Cloud	Average per cent.
Apple	15	10	10	30	24	15	20	22	5	16⅝
Pear	.....	75	1	40	27	13	75	18	.....	35⅓
Peach	.....	.....	.....	.....	.....	5	.....	5	.....	5
Plum	.....	.....	.....	20	13	5	.....	50	.....	22
Cherries	25	25	.....	80	35	5	80	55	80	48⅛
Dewberries	.....	.....	.....	.....		.....	25	.....	.....	25
Raspberries	.....	.....	.....	50	.....	.....	.....	.....	.....	50
Strawberries	.....	.....	.....	80	.....	.....	.....	75	.....	77½
Gooseberries	100	10	25	75	50	20	75	100	.....	56⅔
Currants	.....	.....	.....	50	50	18	.....	.....	.....	39⅓
Grapes	....	.....	5	20	10	12	25	25	.....	16⅔

In the absence of Mr. Greene, I am asked to present a report concerning a matter that was taken up last July in which the growers of Kansas, Missouri, Nebraska and Iowa called a meeting at St. Joseph for the purpose of ascertaining if it would be possible to secure a reduction in rates on railroads that would give these western states the same rates to southern and southwestern markets as are paid by the sections in the East and Northeast.

APPLE FREIGHT RATE MATTERS.

By GEO. O. GREENE, Manhattan.

Next to successful growing, probably the most important problem to the apple producer is that of successful marketing. There are a few apple growers with sufficient business ability to enable them to understand packing and packages, and the general demands of the market, so that in spite of the ordinary adverse conditions in the business they are able to make more or less of a profit. There are a few of this number who have the ability and intelligence to notice any discrimination in the favor of growers in other sections, who will demand that they be given an equal opportunity, both in the matter of freight rates and other privileges. Those who have demanded that they be given an equal rate on apples to other markets with the growers from eastern states, have found out that it is impossible to do anything without a general organization. How easy it is to organize the growers and shippers can be imagined when we consider the fact that after the fight was started for better apple rates, letters were sent to some fifty growers and shippers of note, telling them that inasmuch as the state made no appropriation to carry on a fight of this kind, we would be glad to have them contribute to aid in getting a better rate on apples to eastern and southern markets. Four of them responded.

During the spring of 1913 there were many exchanges of letters between the growers and shippers, and the horticulturists of the Missouri valley, which resulted in the calling of a meeting at St. Joseph on July 16

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for the purpose of considering the discrepancy in rates between the Missouri river points east and south and from the east, west and south. The growers who had been attempting to ship to the Middle states and southern markets had found that they were paying anywhere from $20 to $45 a car more for carloads of apples to these points than were the growers of New York and New England. In some cases the freight charge on a car of apples to a given point was $25 more, even though the distance from the Missouri river was only half that from the New York point.

Another important point that was brought out during the meeting by one of your well-known Kansas growers was the fact that the minimum car of meat and apples was the same tonnage, 24,000 pounds. The rate on meat from Missouri river points to Chicago is 23½ cents, and a car of meat is valued at about $3000. The rate on apples from Missouri river points to Chicago is 27 cents, and a car of apples is valued at not over $500. In other words, it costs $64.80 to send $500 worth of apples to Chicago, and $56.40 to send $3000 worth of meat. We are practically the same distance from Chicago as is Rochester, and it costs us $20.40 more to send a carload of apples to Chicago than it does Rochester. Why we should have such a high rate as compared with eastern points can hardly be understood by the ordinary layman. As a matter of fact, it would be a doubtful statement to say that the traffic managers know their own system of applying freight rates. In view of the fact that an acre of well-cared-for orchard will produce a carload of fruit to be hauled a considerable distance, and that it will take from four to ten acres of any other farm crop to produce the same amount of freight, it would seem that railroads should encourage rather than discourage the growing of this crop.

All of these things and many more were brought out at the St. Joseph meeting, and a committee was appointed, consisting of four members, one from each of the four states of Kansas, Missouri, Nebraska, and Iowa. The members of this committee were Mr. Elliot Marshall, surveyor of customs at St. Joseph, Mo., Mr. J. M. Bechtel, from Hamburg, Iowa, a very successful and quite wealthy fruit grower, Hon. E. M. Pollard, of Nehawka, Neb., excongressman from that district, and the owner of 160 acres of profitable orchard, and Mr. Greene, the extension horticulturist, from Manhattan.

A meeting of this committee was held some time later, in which the following brief was drafted and sent to each of the general freight agents whose respective lines carry fruit from Missouri river points:

"*Dear Sir:* At a meeting of the growers and shippers of apples held at St. Joseph, Mo., on July 16, 1913, a committee was appointed to represent apple men of each of the four states of Missouri, Kansas, Iowa, and Nebraska, to bring to the attention of the general freight agents of the trunk lines of railroads entering Missouri river territory the very high rate that exists on apple shipments in car lots east and south from the Missouri river territory. This committee was instructed to ask that you investigate this matter and compare eastern rates to the Missouri river and southern points with the rate from Missouri river territory to eastern and southern points.

"We desire to call your attention to some of the great disadvantages under which the Missouri valley growers are laboring: (1) Middle states buyers who are closer to the Missouri valley states than to New York

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and New England have pointed out that they can not buy in the Missouri valley because of the prohibitive rates on apples by the car from these points as compared with the rates from New York and New England, even though the haul from eastern points is much longer. (2) The New England rate to Chicago with an average of 886 miles is 30 cents. The Rochester territory is 608 miles from Chicago with a rate of 21 cents. The Buffalo territory is 540 miles from Chicago with a rate of 18½ cents. The average distance from Missouri river points to Chicago is 500 miles with a rate of 27 cents.

"With shipments south, the same much higher rate holds true. From Rochester to Nashville, a distance of 817 miles, the rate is 33 cents; from New England the average distance is 1095 miles with a rate of 36 cents; from Missouri river points the average distance is about 650 miles with a rate of 45 cents. The average Missouri river point is 167 miles nearer Nashville than Rochester, yet the rate is 12 cents higher than the Rochester rate. The average Missouri river point is 445 miles nearer Nashville than the average New England point, yet the rate is 9 cents higher than the New England rate.

"You do not get anywhere near the tonnage to ship over your line to eastern and southern markets that would naturally fall to you but for the prohibitive freight rates. Inasmuch as the long haul is yours to Middle states and southern markets from Missouri river points and the opposite is true from New England and New York points, we fail to see where the western roads profit by the present system of rates. We believe that much can be done by your road to induce Missouri valley growers to trade in southern and Middle states markets, were you to reduce rates to a basis on which these growers could compete.

"Some of the great trunk lines are maintaining highly salaried officers whose duties are to encourage the various lines of agriculture and to induce shippers to market their products over their respective lines. With the present prohibitive rates on fruits, their efforts along this important line of agriculture will be greatly retarded.

"The traffic managers of the great trunk lines have strongly contended that the middlemen and not high freight rates are responsible for the present high cost of living. Yet, the average price received by the grower, as taken from statistics gathered in Missouri and Kansas, in 1912 was 78 cents per hundred pounds, and the average cost of shipping to Middle states and southern markets was nearly 50 per cent of the price received by the growers. Add to this 25 cents per hundred pounds for packages, and 30 cents for storage, which must be paid by the consumer before the dealer's profit, and you will readily see why thousands of barrels of good apples rotted in the orchards of the Missouri valley, on which you might have received a profit had there been in force a more equitable freight rate. It was impossible for the Missouri valley growers to compete in these markets with the growers in Massachusetts and New York.

"We ask for the following rates on apples in car lots of 24,000 pounds, minimum, from Missouri river points: To Chicago, 20 cents; to St. Louis, 16 cents; to Indianapolis, 23 cents; to Cincinnati, 24 cents; to Louisville, 26 cents; to Chattanooga, Tenn., 35 cents; to Memphis, 20 cents; to Nashville, 32 cents; to Birmingham, 39 cents; to New York city, 50 cents; to Boston, 55 cents; to St. Paul and Minneapolis, 23 cents; to Fargo, 35 cents.

"While we are not asking for a general reduction of freight rates, we do ask for rates that will put us on an equal basis with eastern growers and that will tend to increase rather than to decrease the output of Missouri valley orchards. When the Missouri valley grower sees that the Rochester grower has an advantage of $24 on each car shipped to Birmingham, even though the Missouri valley grower is 225 miles closer to Birmingham than the Rochester grower, $47.60 to Nashville, to which city he is closer by 125 miles, $36.40 on each car to Memphis, to which city he is closer by 460 miles, and an equal advantage to other markets

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closer to him than to the eastern grower, he feels the necessity of curtailing his output. He can not afford to help pay the premium offered by your road and other roads to the eastern grower to ship his stuff by the long haul over eastern trunk lines and by a short haul over your road to the southern markets.

"In view of the fact that your road participates very lightly in the profits on apples shipped from eastern United States to Middle and Southern states markets, it seems to us that from a profitable standpoint to you, it can not be too strongly urged that you use every possible effort to encourage the Missouri valley fruit grower to produce and ship more fruit over your lines."

This brief was docketed and a hearing set for December 16, and the committee, at a meeting in Council Bluffs on December 2, appointed the chairman, Mr. E. M. Pollard, to represent the committee at the hearing. If at this hearing the general freight agents decide to grant our request for a reduction in rate, we will have accomplished a work that is of considerable importance to the apple-growing section of Kansas, Missouri, Iowa, and Nebraska. It would have meant a saving to the growers who shipped out of Troy, Kan., in 1912, of something like $18,000. Should our request be turned down it will be necessary to take the matter before the I. C. C., and in that case it will require that somebody stand the expenses of carrying the case up. It will mean traveling expenses and perhaps the employment of rate lawyers to bring about and accomplish the purpose of this committee. As far as we have gone, I believe that the committee in each case has furnished its own expenses, with the exception of $14 that our growers here in Kansas have contributed towards the work. If the work is to be carried on and our fruit growers wish to compete in southern markets which are right at our door, the funds must be placed in such a condition that they can be used at a moment's notice. When we consider the fact that we are closer to Memphis by 460 miles than is the Rochester grower, and yet he can reach that market cheaper by $36.40 on each car than we can, we see how important it is that we do not stop now and have to go to all the initial expense sometime in the future to again take up the fight.

REPORT FROM THE SIXTH DISTRICT.

By J. J. ALEXANDER, Trustee, Norton.

The spring of 1913 started in with the best prospects that we ever had for a bountiful crop of fruit. The bloom was all that could be asked for, and the fruit set was from 75 to 100 per cent. But the extremely hot weather, which cut our fruit crop about one-half, set in about the first of July. The fruit was very poor and tasteless, except where the trees were sprayed.

Apples were from nothing to 50 per cent of a full crop. Pears ranged from 25 to 100 per cent of a crop. Kieffer, Garber and Bartlett were the best, with the Kieffer in the lead.

Peaches suffered very badly. In fact they dried up on the trees before the fall rains set in. We were without rain for over a hundred days and it was the hottest weather ever known in our part of the state.

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Plums were better. We had from one-fourth to 100 per cent of a full crop. Wild plums were all stung and of no account. Tame plums did fairly well and the quality was good. The Elwood bore a full crop in spite of the dry weather. The New American, Weaver, De Soto and Lombard bore not more than half a crop, but they were of good quality. We had no enemy to the plum this year to speak of.

Cherries were at least 75 per cent of a full crop and were very fine. The Early Richmond and Montmorency were the main varieties raised in our part of the state.

Blackberries, raspberries, in fact all kinds of berries, were a failure, except gooseberries. They were from one-third to a half crop.

Grapes were very light, none reporting more than one-fourth of a crop.

As to varieties of fruits that do best in this section of country, I find that of summer varieties of the apple, Duchess of Oldenburg and Early Harvest have proved the best for me. The Duchess seems to be the hardiest of all the summer varieties. Of winter apples, the Ben Davis, Winesap and Missouri Pippin are the best, but most all winter apples do well here if properly cared for. Orchards, however, must be sprayed and watched carefully in the spring and early summer, or we do not get apples that are fit for use. Colding moth sting all the apples that are not sprayed, causing them to fall off prematurely.

Peaches all suffered alike from the effects of the late frosts and the drouth.

Of cherries, all that belong to the Richmond family do well in this part of the state.

The Concord grape is about the only grape planted with us.

Insects: We have about all kinds of these pests. We have borers in the peach and codling moth in the apple; these being the worst. Spraying is not done here to any great extent, but where the people have sprayed their trees, the results are very marked and satisfactory. We must spray more or not get fruit.

Planting was not done here to any great extent last spring, and there will be less I fear this spring of 1914, owing to the past extremely hot and dry seasons.

Our people are not taking the interest in horticulture I wish they would. After losing so much from drouth, they have become discouraged. Our trees are in good condition this fall, since the late rains. From September until the present time we have had an abundance of rain. We have had over five inches in December. So now the fruit buds are in fine condition to go into winter, and the condition of all kinds of trees is fine.

Forest trees have not been planted to any extent outside the towns. There is a good interest in shade trees in the towns, and they do well where they are properly cared for.

The last frost we had last spring was about the 5th of May, and the first this fall was the last of October.

We hope we will be able to do better in the future, with the ground so thoroughly soaked as it is and the good conditions at the present time.

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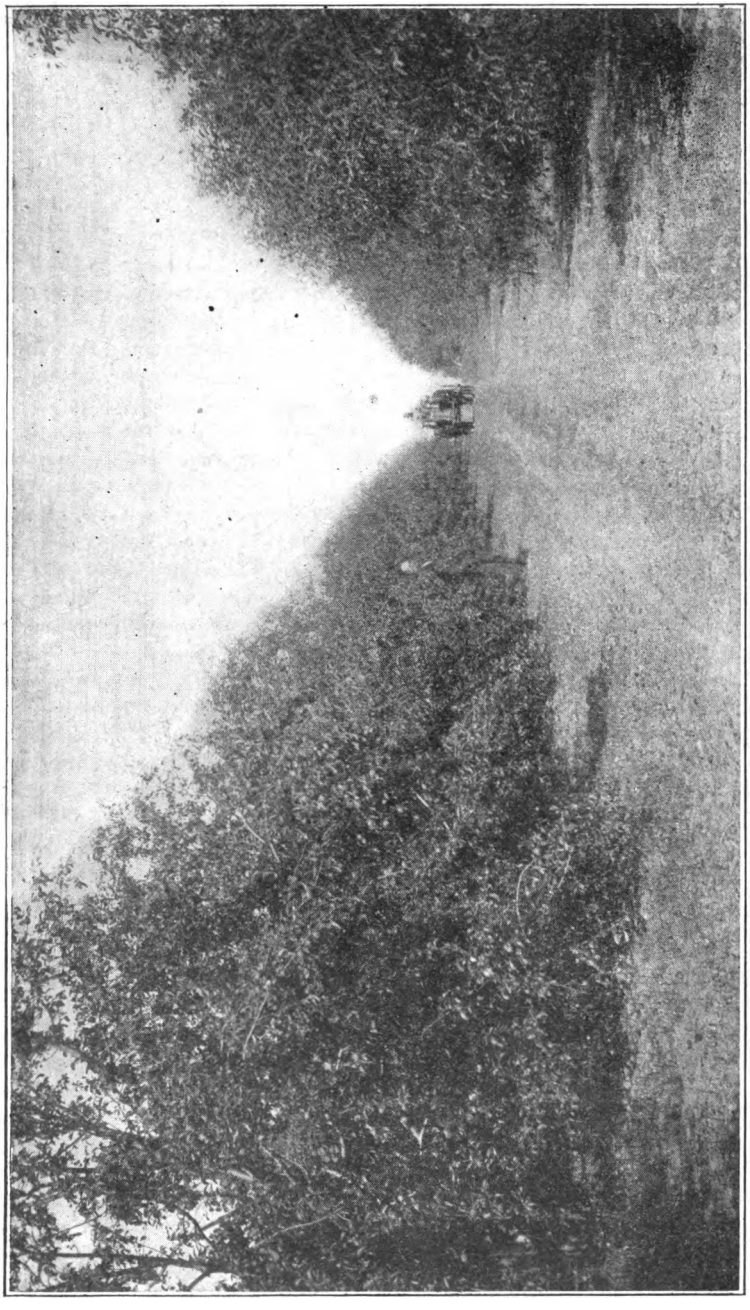

ORCHARD OF H. HULSE, MANKATO, JEWELL COUNTY.

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REPORT FROM THE SEVENTH DISTRICT.

By C. A. BLACKMORE, Trustee, Sharon.

The general condition of fruit buds and trees in January, 1913, was good except peach buds. Most of the peach buds were killed on the 3d, 4th and 5th of January. Trees were in good condition in the spring and put forth a good crop of blossoms. All varieties of trees set a good crop of fruit, except the peach, which set a very small per cent of a crop. About the first of May a frost destroyed the apricots and slightly damaged the cherry. The season being extremely dry, fruits of all varieties were small. Apples nearly all fell from the trees before maturity. However, orchards that were well cared for did fairly well. We had a number of bushels of peaches which were very fine.

Insect pests were very numerous in places, where they had the whole list and then some. Where spraying was practiced no worms were reported. Fruit trees were planted very extensively the past season, but the loss was great; not over one per cent grew. People are greatly discouraged because of their failures in getting trees to grow. There will be but few trees set during the coming year.

Trees and vines have gone into winter quarters in fairly good condition. The dry season and fall rains have not only caused the buds to swell, but in many instances they have bloomed.

Birds! Well, never before have I been so tempted to kill the birds. I think we had the whole list and then some thrown in. The birds destroyed almost the entire crop of grapes.

As the seventh district is a large one, and as but little rain fell in portions of it, and since conditions were peculiar in sections, I will report by sections or counties.

BARBER COUNTY.

Per cent of fruit gathered: Apples, 25; pears, 50; peaches, 1; plums, 50; cherries, 25; grapes, 50.

Varieties of fruit doing best: Apples—Ben Davis, Winesap, Missouri Pippin, York Imperial, Early Harvest, Red Astrachan, Cooper's Early White, Red June, Maiden Blush. Peaches—Greensborough, Carmen, Champion, Crawford (Early and Late), Foster, Salway, Henrietta and Mammoth Heath. Plums—Abundance, Burbank and Gold. Pears—Kieffer, Garber and Duchess. Grapes—Campbell's Early, Agawam, Niagara, Concord, Hicks.

PAWNEE COUNTY.

Apples, 100 per cent; pears, 10 per cent; plums, 10 per cent; cherries, 20 per cent.

Varieties of fruit doing best: Apples—Red Astrachan, Maiden Blush, Missouri Pippin, Jeniton, Winesap, Mammoth Black Twig. Pears—Sudduth, Duchess. Cherries—Sula Hardy, English Morello.

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CLARK COUNTY.

Plums, 10 per cent; cherries, 10 per cent; blackberries, 75 per cent; grapes, 75 to 90 per cent.

Varieties doing best: Apples—Yellow Transparent, Maiden Blush. Peaches—Elberta and Champion. Pears—Kieffer, Clapp's Favorite. Plums—Wild Goose. Cherries—Dyehouse, Montmorency, English Morello. Grapes—Concord, Niagara, Moore's Early, Diamond.

EDWARDS COUNTY.

Per cent of fruit harvested: Apples, 25; plums, 75; cherries, 50; raspberries, 50; strawberries, 100; gooseberries, 50; currants, 100; grapes, 50;

Varieties of fruit doing best: Apples—Winesap and Missouri Pippin. Peaches—Red Bird Cling, Mamie Ross, Elberta. Pears—Garber and Seckel. Plums—Gold, Abundance and Wild Goose. Cherries—Early Richmond. Grapes—Concord.

KIOWA COUNTY.

Per cent of fruit gathered; Peaches, nothing to 50; pears, nothing to 50; cherries, nothing to 10.

HODGEMAN COUNTY.

Apples, 10 per cent; pears, all blighted; peaches, 50 per cent; plums, 60 per cent; cherries, 70 per cent; strawberries, 40 per cent; grapes, 40 per cent.

Varieties doing best: Apples—Winesap, Missouri Pippin. Peaches—seedlings down the list. Plums—Wild Sand. Cherries—English Morello. Grapes—Wild.

FINNEY COUNTY.

Per cent of fruit gathered: Apples, 60; pears, 10; plums, 25; cherries, 50; blackberries, 60; strawberries, 50; grapes, 60.

Varieties of apples doing best: Missouri Pippin, Ben Davis and Winesap.

BARTON COUNTY.

Per cent of fruit harvested: Apples, 50; pears, 25; plums, 20; strawberries, 50; goosberries, 50; currants, 25.

Varieties doing best: Apples—Ben Davis, Missouri Pippin, Winesap. Peaches—Elberta. Pears—Kieffer.

Lane and Harper counties report entire failures.

KINGMAN COUNTY.

Per cent of fruit harvested: Apples, 50; plums, 30; cherries, 50; blackberries, 30; strawberries, 25; grapes, 60.

Varieties of fruit doing best: Apples—Early Harvest, Red June, Winesap, Ben Davis and Missouri Pippin. Peaches—Elberta, Stump. Pears—Kieffer and Garber. Cherries—Early Richmond. Grapes—Concord and Moore's Early.

RICE COUNTY.

Per cent of fruit harvested: Apples, 25; plums, 25; cherries, 25; grapes, 100.

Varieties doing best: Apples—Early Harvest, Winesap, Missouri Pippin, York Imperial. Peach—Elberta. Pears—all kinds. Plums—

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Marianna, Wild Goose. Cherries—Early Richmond. Grapes—Concord and Diamond.

C. A. BLACKMORE: I dehorned some of my trees and had good peaches on them.

PRESIDENT TREDWAY: How much did you cut off?

MR. BLACKMORE: That depended on the tree; from some trees that had not had a good growth I did not take off much. From trees that had had a good, vigorous growth I took off more. I took some of the peaches down to the dry congress at Tulsa, and I had the best that were there.

May I digress a little here? I do not like to bring myself into it. I have a custom of setting out a block of trees every year, and as my neighbors pass they always see these trees growing; perhaps they planted some trees from the same stock and they did not grow. I seldom lose a tree. This year I planted more than a thousand trees, and did not lose a handful. Consequently they (the neighbors) wanted to know something about this growing of trees. I find, in my business, that there are no people interested more in anything than they are in good fruit; from the old to the very small, they are interested in good fruit, but when they pay out thousands of dollars, like our county did this year, and get little, they are discouraged. I had to consent to give them a little speech on the growing of fruit trees. The president and secretary of the farmers' institute published in the county papers that I would talk on fruit and fruit growing "from the cradle to the grave." They got me stuck; I had to do something. I armed myself with some seed, some seedling trees, and with budded trees, yearling trees and grafts—grafts a year old, and larger trees—and I took my tools there, and we had a regular demonstration in the courthouse. I had lots of brush and vines there. I instructed them how to grow grapes from cuttings so that they need not lose any; I showed the planting of the seed, the growing of the yearling trees, budding, after care of the tree and bud, and showed the bud in the dormant state, and then the grafting; I showed them how, in the spring, if the bud failed to grow, they could just dig down and throw away a little dirt from the roots and put a graft on each one. I showed them how to take care of trees received from the nursery, heeling them in, and pruning after setting, pruning each injury; and they became interested. The agricultural school was there, a class of forty, and from the way they used their pencils and tablets, they must have filled the tablets full. I showed them how to dehorn trees, and so on; and the thought came to me that if we could put something in these reports so that they would learn some of the little things it would be of great benefit. Nearly always we have some little seedling tree of some variety, and we would like to have fruit of that kind, but it is hard to buy a tree of that kind. Of course, an agent can sell it to you, but it is often something else. Perhaps we have a seedling out here, and it has loose roots. Just by scraping the dirt down below the roots, and putting a graft in each one, you have a tree there that same year. If our people understood these things they would not get so discouraged.

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REPORT FROM THE EIGHTH DISTRICT.

By F. E. WICKHAM, Trustee, Wichita.

Trees and fruit buds entered January, 1913, in a normal condition. The winter was very dry, and when spring came grapes and blackberries showed considerable damage. Many called it winter-killing.

Peaches and apricots did not bloom. Other tree fruits showed plenty of bloom, except Ben Davis and Mammoth Black Twig apples. The bloom on most small fruit was light. Light frosts occurred during the blooming period of the apples, especially of the Winesap. A light apple crop set according to the bloom, and some thought the frost had done the damage. Others argued that it was lack of pollination, due to the inclemency of the weather.

The past spring and summer have been the driest in the history of fruit growing in the eighth district. The showers were local and seemed to be heaviest in the southern part of Sedgwick and the northern part of Sumner counties. The extremely dry weather showed the fruit grower, as never before, the adaptability of his soil to orcharding. With the lessons learned the past season, we are in a better position to carry forward the production of better fruit. Many of our commercial fruit growers are installing irrigation plants as an aid in this direction.

Our fall rains began the 10th of September, and since then we have had an abundance of moisture.

Our trees, plants and bushes are not all going into winter in the best condition, owing to the excessively dry, hot summer.

Some fruit growers reported heavy damage from insects, and others reported the damage light. The San José scale is still with us, and likely to stay. Those who have used the lime-sulphur solution for several seasons report the most gratifying results in holding the pest in check. The San José scale has ceased to be a formidable foe to the growing of good fruit.

There was considerable twig blight on the apple and pear the past season, and but very little blotch reported. Spraying is practiced by our successful fruit growers, and is considered one of the necessary methods to produce good fruit.

Fruit-tree planting is on the decline, except in a few localities. The interest in fruit growing seems to be on the decline, except among the commercial growers. Forest-tree planting is also reported on the decline.

Many of the reports say the birds are decreasing. The birds have done more damage to fruit the past season than for several years past. One large grower reports all the birds as fruit eaters this year. One of the reasons given for damage done by the birds, was scarcity of feed and water the past summer.

The varieties of apples recommended for this district are: Summer—Early Harvest, Red June, Maiden Blush and Cooper's Early White. Fall—Grimes Golden, Jonathan and King David. Winter—Winesap, Stayman Winesap, Black Ben, Delicious, Champion and York Imperial.

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The favorite varieties of peaches are: Champion, Elberta, Carman, Mountain Rose, Mamie Ross and Crawford. Kieffer, Garber and Duchess are popular varieties of pears.

The Wild Goose, Red June, Shiro, Damson, Abundance and Burbank plums are recommended.

Our best cherries are Montmorency, Early Richmond, and English Morello.

Concord, Moore's Early, Brighton and Niagara, are the leading grapes.

From reports received, we have estimated the fruit crop for the eighth district as follows: Apples, 15 per cent; peaches, none; apricots, none; cherries, 30 per cent; pears, 8 per cent; plums, 5 per cent; blackberries, 15 per cent; dewberries, 10 per cent; raspberries, 40 per cent; strawberries, 15 per cent; grapes, 15 per cent.

PRESIDENT TREDWAY: That concludes the reading of the reports, and as was suggested, the reports are open for discussion. Let the discussions be brief as possible and to the point, and they will prove of very great interest, I have no doubt.

G. M. JOHNSON: He spoke of setting out his trees this year and losing practically none, but he neglected to tell us how he did that. I would like to know.

C. A. BLACKMORE: The blocks of trees that I set out this year were where I had my first old peach orchards. I had to get rid of these and reset the orchard. I did this by putting a chain right around the peach tree, fastened it to a 12-foot pole, hitched a team and twisted them out and dragged them off. It is in between where these rows of trees stood that I have set my trees this year. This is how I plant trees: I take my plow, and where I want my row I throw out two furrows just as deep as I can plow them. The ground should be prepared the year before, and in preparing this ground—now remember as I tell this, it would not do for all of you to do as I do, because some of you are differently situated, and where you are on hard soil, don't do this, but follow this for sandy soil only, throw out your furrows and have your ridges so that after the trees are set the ridges will be in the middle, between them. After your ground is in condition—now let the grass and rubbish alone this spring, just go two rounds where you want your trees to set, then cross-furrow it about every twenty feet—I like to have the trees about twenty feet apart in the row. I set my trees in the crossings of these furrows. I am talking now about peach trees. Apple trees would not want to be set as deep. In setting a tree, I want the hole big enough so the roots can all be spread out. If there is a tap root have the spade jabbed down in the hole and just ram the dirt on that tap root. As the dirt is thrown in I hold the tree and I hold the rammer, and maybe shake the tree a little to get the dirt settled, then set the tree just like I would a post. Now, then, cut the top off. Do not leave a little, but cut the limbs all off. I leave little stubs for this reason: if you cut too close at the top it dries in there and it is hard to heal this wound and start the tree to growing, but if you have limbs cut leaving little stubs it is an easy matter to make the trees grow. But don't cut back apple and plum trees quite so much.

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B. F. SMITH: I have been a member of this society for thirty-two years, and I have been a close observer of the reports, and we have never had a meeting—I don't call to mind one—when we have had all the trustees from every district, present; but they are all here this time, and I have never heard better reports, and I tell you it is encouraging. They have gone into details in these reports, and there is not one sitting here who has not learned something. I feel greatly encouraged at these reports, and I think if we will go into smaller acreages of berries and orchard fruits, peaches and apples, we will do better than we have. Twenty or twenty-five years ago there was a great mania for planting large orchards. These old orchards are gone. I think we are going to take a new start. In our county in 1917 we expect to have our fiftieth anniversary, and if we do we are going to invite the Kansas State Horticultural Society to come down in a body, and we will have a jollification.

MRS. CORA WELLHOUSE BULLARD: Reference was made in one of the reports to the matter of hog pasturing in the orchard. This is a matter that has come before the society very often, but I would like to ask Mr. Darrow what he thinks about hog pasturing in the orchard.

GEO. M. DARROW: I think the hog pasture in the orchard is only adapted for certain conditions, but I have seen places where they needed hogs in the orchard. They are needed in orchards where such diseases as bitter rot and black rot are found, and it is not practicable to cultivate those orchards the following year; say, if you can put hogs in one year and with thorough spraying get control of the diseases, after that they do not need hogs in them.

A MEMBER: I would like to ask the gentleman from the Seventh about that grafting—those seedling apples.

MR. BLACKMORE: A nurseryman grafts a tree one way and the small grower that don't have many tools grafts another way. The nurseryman takes his stuff inside in the winter and grafts indoors. The small grower goes around over the orchard and finds a sprout here and another there; and I will just tell you how he could do. Dig down and pull the dirt away for two or three inches below the surface, put the graft in there, and by fall he has got a good tree. The only secret is to get the bark scion so it will connect with the bark of the root, and the outer side of the scion wedgeshaped, just a little thicker than on the inside. This is easily done and anybody can do it; school children and even old men and women down our way say they are going to have a little fruit growing of their own.

President Tredway then appointed the following committees:

Credentials—F. W. Dixon, F. E. Wickham, J. M. Graves.

Membership.—J. L. Williams, G. M. Johnson, Edwin Snyder.

Exhibit.—O. F. Whitney, Geo. A. Blair, Mrs. B. B. Smyth.

Auditing.—F. L. Kenoyer, B. F. Pancoast, J. B. Myers.

Obituary.—Mrs. Cora Wellhouse Bullard, Prof. Albert Dickens, W. R. Martin.

Resolutions.—G. L. Holsinger, A. L. Brooke, C. A. Blackmore.

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SHRUBS AND HARDY PERENNIALS.

By Prof. M. F. Ahearn, Manhattan.

Mr. President, Ladies and Gentlemen: I feel a great deal, in this my first appearance before the Horticultural Society, like the Chicago bride who wept at her wedding because she had no previous experience along that line. Now that she has taken the first plunge she will laugh at all future splicings.

Realizing that this subject is a step removed from the main subject of horticulture, and probably will not arouse as much interest as other papers that are read to you to-day, I intend to confine myself to a concise presentation of this phase of horticulture. Personally, I am of the opinion that not only fruit growers, but all property owners should be vitally interested in the planting of hardy shrubs and perennials. During the last fifty or sixty years there has been a marked advance in the appreciation of shrubs and perennials, and the farmer, the fruit grower and their city brothers are spending time and money in an effort to improve that part of the grounds which surrounds the home. We may ascribe this to an evolution that has taken place along all horticultural lines. Half a century ago men planted apple, pear, peach, plum, and cherry trees, and overlooked the useful and valuable small fruits. At the present time the small-fruit industry is of no small importance in the horticultural world. Several years ago, when ornamental planting was suggested, people thought only of planting groves of trees, and the shrub and perennial were shamefully neglected. To-day no planting is considered complete without its full share of hardy ornamental shrubs and perennials. This is as it should be, for they have a beauty and individuality that fit them for planting in places where trees would certainly appear incongruous. Their increased popularity is due largely to our study of nature and the teachings of competent landscape gardeners. Every year more wild plants are being transferred to our cultivated gardens, and each year more magazines and papers are publishing articles from the pens of eminent landscape architects. The beautifying of the home grounds is indeed of paramount importance. It increases the value of the property, but aside from the monetary value it gives pleasure, comfort and satisfaction, not only to the property owner himself, but to many others who pass that way.

Taking for granted that shrubs and perennials are necessary to complete landscape plantings, the question naturally arises as to the best methods of planting and the proper selection of varieties. Specific problems require a specific treatment, and it should be understood at the outset that absent treatment is not successful in these cases. General directions may be given, however, and it is my purpose to present some of these ideas in as simple a manner as possible. Scientific names and long descriptions may be found in most of the seed catalogues, and it is unnecessary for me to dwell on these points. Catalogues are put out by nurserymen and others to sell their stock. Beautiful cuts of many plants are

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shown in gorgeous colors. Descriptions of this or that shrub occupy an entire page, and it is safe to say that many of these plants look better in the catalogue than in the ground. Where this literature fails is in not giving the reader instructions on how and where to plant certain kinds to the best advantage. Very often the plants that receive the most advertising are not suited to soil or climatic conditions found in your locality. Beware of these novelties, and if you must try them begin with small purchases.

A good system is to get the advice of an expert before buying your plants. Have a plan drawn of your grounds, showing the exact location of each tree and shrub. It never pays to plant hit or miss, although I believe that this method is much better than no planting at all. There is a great deal of individuality possible in the planting of shrubs, either as single specimens or in groups. Much depends upon the artistic temperament of the person who has this work in charge. With a little instruction any one should be able to plant a shrub, but it takes a man endowed with good taste and judgment to arrange them properly. Shrubs may be used for a variety of purposes; as screens for an alley, back-yard fence, chicken coops, a neighbor's premises if they are unsightly, in the angles of the buildings, planted in the border, along the drives and the curves of the walks. There are shrubs for nearly every location and every variety of soil and climatic condition. Some thrive on high, dry elevations; others will do better if planted in a low, wet place; some grow best in sunlight, while others may be found that grow under the shade of other trees except evergreens.

The list of shrubs contains many deciduous and a few very good evergreen specimens. About one-fourth of the shrubs of the Northeast are evergreens, while in the Southern states nearly one-half are evergreens. The value of all hardy shrubs depends not only on the bloom, but also on their foliage and habit of growth. Purple, yellow, variegated and cut-leaved varieties are at the disposal of the planter, but should be used sparingly and with considerable caution. Only about one dozen out of a hundred may be in bloom at the same time; therefore select shrubs with a discriminating eye, keeping in mind the size, shape and color of leaves, twigs and bark. With these points in mind the arrangement of these plants on the lawn will be comparatively easy if a few simple rules are followed.

Keep the center of the lawn open; plant close to the buildings, or along the borders; group the shrubs in masses as much as possible; for single specimens use some rare or showy plants, and work for unity both in the group and as a whole. This question of grouping hardy plants in masses or planted as individuals must be approached with considerable care. There is always a tendency to overcrowd in order to get a greater variety. Needless to say, a few well-selected shrubs properly placed are far more effective than a large number of grotesque varieties pushed and crammed and huddled into a restricted area. Never, if it can be avoided, plant in straight lines, except in the case of hedges, but rather seek to produce irregular or curving outlines. A very simple yet entirely effective way is to group a number of one variety together. Where the area is large there may be a diversity of design in these groups, affording an

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opportunity to plant evergreens with hardy shrubs. Trees, if properly banked or flanked with shrubs, give a pleasing view. For individual planting reserve the high points or prominent places so that they may show to the best advantage. As stated before, the chief value of shrubs comes from their use in an ornamental way, but many of them produce edible fruits. Many send out leaves early in the spring, as gooseberry, currant, lilac, Japanese quince, and some of the spiræas; others, like Forsythia and Daphne, are covered with a profusion of bloom at this season. From early spring until the month of November there is an unbroken spell of bloom, and from June until the snow flies ornamental fruits may be seen on the branches. Many, like Viburnum (snowball), grow tall, while some, like the Daphne, only grow a few inches. Several have beautifully colored leaves in the fall and others hold their leaves until the spring. Glossy leaves, hairy leaves, thick and thin leaves are found in abundance. Only the close student of nature will be able to observe the countless beauties of our hardy deciduous and evergreen shrubs, but the least observant person can not fail to appreciate some of their charms.

For Kansas planting it is well to examine the plants found growing in the wild state. Kansas is particularly fortunate in having many native shrubs that are capable of adding beauty to any landscape planting. A few of these shrubs of especial merit are the sumacs, New Jersey tea, bladder nut, dogwoods, lead plants, wahoo, and several others.

A catalogue selection should include the spireas, barberries, mock orange, buckthorn, privet, golden bell, purple fringe or smoke tree, pearl bush, Japanese quince, rose of Sharon, lilac (budded varieties), honeysuckles, tamarisk, Siberian pea and Deutzia. Any of these may be procured at Kansas nurseries at a small outlay of money. Shrubs require little care after planting. Just enough pruning to keep them growing in a graceful manner and to get rid of dead and crossed branches. Watering is rarely necessary after they are well established.

There is no logical reason why shrubs should not be planted in Kansas dooryards; the cost is trifling, upkeep practically nil, and the amount of satisfaction and enjoyment several hundred per cent. A lawn well planted and well kept is a thing of beauty and a joy for everybody.

Thus far herbaceous and bulbous perennials have been given only a passing remark, not because they are considered unimportant but because it seems better to discuss shrubs and perennials as distinct classes. Although in separate classes they may be used in the same group to good advantage. In the perennial garden, and I refer to the herbaceous and bulbous perennials, our grandmothers and mothers spent many pleasant hours. They had what they were pleased to term their "old-fashioned garden." Old-fashioned they might have been, but their beauty was and is to-day ever new and wonderful, and most of those gardens were made up largely of perennials. They are our friends from very early spring, from the time the snowdrop and grape hyacinths push their way through the mulch until the ornamental grasses have withered in the fall. Following closely on their heels are bulbous plants like the tulip, hyacinth, many species of narcissus, and they in turn are succeeded by the

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Iris genus that boasts of a wealth of flowers. Only half appreciated, very often little cared for, yet year after year they present us with blooms that have helped to take care of the rush for flowers on Memorial Day. Then there are the delphinium, columbines, bleeding-hearts, later phlox of many varieties and the hardy asters, while in the late autumn the ornamental grasses shake their handsome heads in a last defiance to Jack Frost. Like the shrubs they are remarkably easy of cultivation but will respond eagerly to encouragement. They are propagated by division, cuttings, seeds and suckers. Unlike the shrubs, watering will prove advantageous in this climate.

This subject should be of paramount interest to everybody who feels the least interest in civic improvement. How much better it would be to have a few of these plants growing on our schoolhouse grounds instead of weeds and trash. A few planted in the cemetery lot will bring greater satisfaction and cost less than carrying bouquets of expensive tea roses and carnations to adorn the grave; several set out in our city parks will undoubtedly awaken an interest in their planting besides giving an opportunity for the people to select the variety best suited to their home conditions.

My earnest desire is that all the members of this society will feel it incumbent on themselves to spread the knowledge they possess in their communities so that there will be a general planting of hardy, ornamental plants, which is bound to produce better appreciation of their true worth in landscape work.

HOME ORCHARDS.

By G. L. Holsinger, Rosedale.

At a comparatively recent meeting of this society one of the commercial orchardists took the stand that as a society we should discourage the planting of home orchards, giving as his reason that they were a failure financially and only a breeder of insects, and I was surprised to see that there were several fruit growers who seemed to agree with this idea.

When the secretary asked me to write a paper I took this topic, as I felt that the whole idea of discouraging tree-planting was wrong, against the tenets of the Kansas State Horticultural Society, and not for the best interests of the state generally.

I believe that we as individuals, or as members of the State Horticultural Society, should encourage the planting of all kinds of trees, whether it be orchards, shade trees in the yards and along the roads, windbreaks, or seedlings for posts, telephone poles and future lumber, and this not only for profit in the near future, but to do some little thing from year to year to add to the wealth of the country for the generations to come.

The success of each farmer or citizen adds to the prosperity of the community, and the failure of each citizen loses that much to the neighborhood. We may say that if a man has not push enough to grow his orchard, or plant shrubs, shade trees, etc., about his own home, that is his own lookout, but it is a loss to the whole neighborhood if one builds a home and allows that home to go with no shade, without vines to cover

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the fences, with no fruit trees, berries or grapes, just as much as it is a loss to the community if some speculator buys up a half section or section of ground and allows it to grow up in weeds, the wet portion to grow into a swamp, the hedges to go wild.

Every one here has seen and noted, in country or city, where a considerable sum of money has been expended in building homes, and possibly barns, and then improvement has been stopped, leaving the surroundings desolate. How much has this helped the neighborhood? Contrast this with the home where we have a home orchard, vines on the porch or fence, blue grass in the yard, the fences kept in good condition, shade and ornamental trees properly placed.

Now it may appear to some that this is getting away from the topic, but it is not. The man who does not have an orchard, small though it may be, will have little if any of the other improvements, and that man who does not have his yard well kept and ornamentals planted around the house will be apt to be the man who has no orchard, or a very poor one if any.

From the standpoint of health we should encourage the home orchard. It is conceded that fruit is beneficial to us, either fresh or preserved, and by preserved I mean that held by different processes for later purposes. From the dollar standpoint we should encourage the home orchard. If the home has a small orchard of the different kinds of fruit, a large reduction in the grocery and meat bill will follow. It has been urged by many that the average farmer can buy his fruit more economically than he can grow it. If this were true, will he do so? If you could go to the store and buy strawberries every day in strawberry time, would you hitch up and drive several miles to get them? If you want peaches, would you do this? And if you live near a small town or a country village, what are the probabilities of the store having fruit when you want it? It is practically impossible to get fresh fruit in any of the smaller towns, and if the farmer or citizen of a small place desires fruit in abundance it is necessary for him to grow it himself.

The point urged against the home orchard was that it was the great breeder of insects, and for that reason we should discourage the planting of "home orchards." It has been shown so conclusively that this line of argument is wrong that it loses all weight. No matter how close you may be to another orchard, if you take care of your trees, spray thoroughly, you can make your fruit clean, and if the other fellow does not he is the loser. Even if your neighbor does not have an unkept orchard, there are enough host plants in the woods and hedges to carry through the year insects sufficient to destroy your crop if you do not keep after them and take measures each year to keep your own fruit free.

The quantity and variety to plant depends on so many different factors that only a general plan can be given. At a meeting of the society several years ago the different members were called on for their list of summer, fall and winter apples, allowing to each five varieties for summer and fall, and, I believe, ten kinds for winter. Although many of those were large growers, no two lists were alike. When we consider the great number of varieties, the difference in taste, market, soil, etc.,

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this is not surprising; yet when we go to a man for his order for trees we are often asked why it is that we do not agree. If we all had the same taste—that is, preferred the same flavor, color, and were alike in all ways—it would be an easy matter to pick out varieties; but as long as you prefer a red tie and I will wear a blue one, just so long will we differ in varieties and kinds of fruit.

Then again, in recommending varieties, I may have a location in which a particular variety is worthless, while on your farm it will give excellent results. I would therefore leave out your particular pet, and in your selection of varieties you would leave out what I consider one of the best.

In making out a list for the general public it is best to use those varieties that will succeed over a wide range of soil and conditions, even if we do leave out varieties that may do extremely well in some particular instances. This paper has to do with Kansas and I will endeavor to use only varieties that give good results over the greater part of the state. For instance, in one orchard that was in its prime about twenty years ago there were a few Gloria Munda apples. These trees bore extremely well and the apples were very large, clear and attractive. I have no doubt but that for each tree of this kind in this orchard hundreds were later planted in this vicinity that never had an apple. In Maryland I saw a sweet cherry tree, about four feet through, that had produced many tons of delicious fruit, and the silver dollars that have been spent for such trees in the Middle West from which no fruit has been picked would probably weigh more than the fruit from several such trees.

For a "home orchard," where home use only is considered, my idea would be as follows: 20 apples, 20 peaches, 6 plums, 10 cherries, 7 pears, 50 grapes, 100 blackberries, 100 black raspberries, 50 red raspberries, 12 gooseberries, and 300 strawberries.

In apples, I would plant as follows: 2 Yellow Transparent, 2 Early Harvest, 2 Maiden Blush, 2 Wealthy, 5 Jonathan, 3 York Imperial, 2 Stayman, 2 Ben Davis or Gano.

Peaches: 2 Greensboro, 2 Carman or Family Favorite, 2 Champion, 5 Elberta, 2 Old Mixon Free, 1 Old Mixon Cling, 3 Crawford Late, 3 Salway.

Plums: 2 Wild Goose, 2 Burbank, 2 Damson.

Cherries: 4 Early Richmond, 4 Montmorency, 2 English Morello.

Pears: 2 Kieffer, 3 Dwarf Duchess, 1 Seckel.

Grapes: 25 Concord, 15 Moore's Early, 5 Niagara, 5 Woodruff Red.

Blackberries: 50 Early Harvest, 50 Mercereau, El Dorado or Blowers.

Black raspberries: Kansas, Cumberland and Black Pearl.

Red raspberries: Cardinal, Early King or Cuthbert.

Gooseberries: Houghton.

Strawberries: Bederwood or August Luther for early, Dunlap for mid-season and Aroma for late.

In planting this orchard and berries I would plant the apples 30 feet apart each way, and the other fruit trees 18 feet apart, except the dwarf pears, which should not be planted more than 10 to 12 feet apart. Blackberries I would plant between the apple trees, as they will have run their course by the time the trees are large enough to interfere. The raspberries could also be planted between the trees, but the straw-

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berry plants should be planted outside of the orchard where they can be given attention that they would not get in the orchard.

In planting an orchard where the first aim is to plant for home use with the idea of having surplus fruit for market, but not primarily for market purposes, if cherries are successfully grown, I would add a much larger proportion of this fruit. Where cherries do well, I consider the cherry the most profitable tree fruit, up to the point where the market is not oversupplied, and in variety I would use about the same proportion of trees as above, 40 per cent each of Richmond and Montmorency and 20 per cent English Morello. It must be borne in mind, however, that in the orchard we are now planning, if it is located near a large town, we might safely add 200 cherry trees, where twenty would be all that could be safely set out near a smaller town.

If we are to increase the number of apple trees, I would add chiefly Yellow Transparent, Wealthy, Jonathan, York Imperial, and Ben Davis, and in addition would plant Grimes Golden.

In planting more peaches I would, of course, add a large proportion of Elberta. The per cent of this variety would be about 50 per cent of the additional peach trees planted, and the remaining 50 per cent divided between Greensboro, Family Favorite, Champion and Salway.

In plums I would add about the same number of each of the three varieties given above, and add either Pottawatomie or Poole's Pride. The Damson is slow to come into bearing, but the demand for them is always good and they are a profitable sort when they are old enough to begin bearing. In adding to the pears I would add all Kieffer.

With the larger orchard find a place for a few chestnut trees. They are successfully grown all over the eastern and middle parts of the state.

In the list which I have selected, I have left out a great number of favorites and you will note that I stick to Ben Davis, Kieffer and Elberta. So far as flavor is concerned they are about equal, but all of these have a place that no other variety of their kind can fill.

PRESIDENT TREDWAY: Gentlemen, that is a very important paper. One written by a practical horticulturist and a paper that should be discussed. Personally, I am very much interested in the paper, having faith in the ability of Mr. Holsinger. You who are contemplating planting fruits ought to discuss it and ask questions.

B. F. SMITH: I am very much interested in the paper. I think a home fruit garden, as I understand it, is a small garden for home use. Well, he might have a lot to sell. Just think of a home out on the prairie in this country that did n't have any fruit trees around it, or any shrubs; just a barn and cattle or hogs. What does it look like? Nothing attractive. People going to buy a farm like that might say, "I don't see anything but a barn and lot of cattle." Such a place would not bring near as much as one with trees and shrubs. I would suggest that a man who has 160 acres should have a five or six acre orchard with a fence around it. I think the varieties are well named, from my experience with varieties of apples and peaches.

F. L. KENOYER: There is one important point on the value of the home orchard that was n't brought out, and that is this: A man, by the expenditure of $50 in the original cost and labor and time in the orchard,

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can add a thousand dollars to the selling value of his place if he wants to sell it. The strongest point that a real-estate man can make is the fruit that is on a place.

PROFESSOR DICKENS: A bigger thing than that is, if a man has a home orchard he won't want to sell it.

EDWIN SNYDER: I want to commend the paper by Mr. Holsinger as one of the best papers and most practicable papers I have ever heard read before the society. One point he made about farmers not having any fruit unless they raised it was a strong one. I have heard farmers say it was cheaper to buy fruit than it was to raise it. These same farmers found it was cheaper to do without it than it was to buy it. A farm without a home orchard it but a desert waste, and no man takes any pride in his place unless he has some trees on it and raises his own fruit; and so far as its being a breeder of insects, that may be true, because the small farmer does n't take the pains to spray. But they are learning, and I believe it will be but a few years until there will be many more farm orchards and they will be better cared for than at present. A man can not make a better investment than to plant a good orchard on his farm; and I agree with what he says as to the size of the orchard. Don't plant too many, and take care of them.

J. L. WILLIAMS: I was here a year ago when a commercial orchardist suggested that the farmer should n't have an orchard. I was astonished, but I am very glad now that he said it, and now these talks to-day will go out over this state as the sentiment of this association. It is dead sure every farmer should have an orchard, and if you will travel over this country anywhere, and you don't see any orchard on a place you may know that it is occupied by renters. No wonder the boys and girls rush off to the cities and leave the country without any population. Our city populations are increasing very rapidly, and a great deal of it is so simply because there are not enough attractive orchard homes. Orchards and flowers around a home will do a whole lot toward making the boys and girls, at least a part of them, help to keep this country going.

A MEMBER: I have been especially interested in a large commercial orchard for a number of years. I was here last year and heard that criticism. I believe with Mr. Holsinger in regard to the small orchard, and I believe that the future success of fruit growing in Kansas is going to depend more on the small home orchard than we can ever depend on the large commercial orchard, for the simple reason that the farmer and the farmer's children are becoming better educated as to the care of their orchards, and in the future are going to be better educated to take care of the home orchard than the commercial orchardist will ever take care of the large orchard.

A MEMBER: I believe the Winesap was not in that list of apples. I know the eastern part of the state has a good deal of difficulty with the scab on the Winesap, but you take the Arkansas valley and upland, and I believe the Winesap is to be recommended.

G. L. HOLSINGER: Of course you understand that list is n't adapted to every part of the state. I would like to have that paper discussed a little more as to varieties. I did n't expect everybody here to agree with me on

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that; that is n't to be expected, and I think the society should go to work and chop it up and find fault with the varieties; tell what is good in your locality, because people living in certain localities would know that what I said would n't answer for their localities. For Wyandotte county I have tried to make that list pretty broad, but naturally, with the great list of fruit we have, you can not get all the good ones in. I know there will be parts of the state where something else will be better. I would n't plant Winesap with us, because it scabs too badly.

PRESIDENT TREDWAY: What about the Missouri Pippin?

G. L. HOLSINGER: I would n't plant it for a home orchard.

B. F. SMITH: What about the Red June?

G. L. HOLSINGER: For a home orchard you have got to cut the list down. I think with the Yellow Transparent and Early Harvest you have sufficient early apples.

A MEMBER: How about the Duchess?

G. L. HOLSINGER: Well, now, that comes in the same class.

EDWIN SNYDER: This matter of varieties is very important, and I believe that unless a person is well posted on fruit, if he is going to plant a home orchard, he better just take the varieties they say, as suggested, and let it go at that. Some one recommends the Missouri Pippin. I would n't plant it for any purpose. In the first place, it is very poor fruit; it scabs so badly. The tree is short lived, and there are so many objections to it I would n't plant it at all.

J. J. ALEXANDER: I agree with Mr. Holsinger in most of his paper; but not in his varieties of peaches. The Elberta may be all right down there with him, but out with us it is too tender in the bud. I have had Elbertas that did n't have a blossom on them, while the Crawford and Crosby, next to them, had plenty.

G. L. HOLSINGER: Just take the reports from the different districts read to-day, and I noticed particularly that Ben Davis, York Imperial, Elbertas and Crawfords were in practically every report as doing the best.

C. A. BLACKMORE: I don't think Mr. Holsinger intimated that this list was good for all sections, but I do think it was one of the best general lists he could have stated. In our district I should have thrown Moore's Early out entirely and put in Campbell's Early.

ALBERT DICKENS: I believe we have not yet come to appreciate the limitations of varieties. I know varieties which succeed in the Arkansas valley that it would be almost useless to plant on the uplands. I think our friend from Doniphan county will say that the variety of soil is a matter which the man planting a home orchard ought to consider most seriously, and he ought to think in terms of his own. See what succeeds in your own location, in your own soil, in your own exposure. I believe he is right in saying not to plant too many varieties. I would like to pat that Wealthy on the back a little. Last year a man whose Wealthy trees began to bear sold Wealthies early in the summer, in the middle of July, and he was still selling Wealthies in competition with Jonathan the first of October.

F. L. KENOYER: Just a word in regard to Moore's Early grape. It is tender and subject to phylloxera. Nearly everybody who sets out grapes

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has some other kind growing, and phylloxera will take it almost to a certainty.

C. A. BLACKMORE: I have the Campbell's Early on all varieties of soil, and it is undoubtedly the best grape of its season. I gave it to my brother-in-law and father-in-law in Missouri. They say it beats all other grapes in the neighborhood. There is no sand there. It is a heavy clay soil.

F. L. KENOYER: That is easily explained. You go out here a few miles and plant Campbell's Early. For the first few years it will grow fine. Maybe there is n't any phylloxera where he planted his grapes, and maybe next year it will be there and maybe next year it won't. It is like pear blight.

C. A. BLACKMORE: We can not help this phylloxera; it is getting in. What are we going to do with Moore's Early?

A MEMBER: What is the matter with it?

C. A. BLACKMORE: It is too sour.

G. L. HOLSINGER: On the Kansas City market the Moore's Early is the highest priced grape we have. The Champion will probably bring the best money because it is the first in. When the Moore's Early comes in the Champion is down and out, and certainly the Moore's Early can hardly be classed as a sour grape in the black varieties when you put it in competition with the Concord. It is more tart than the Worden, but there are many other grapes that are not so sweet as Moore's Early. When it comes to the matter of selling the grape, I have never heard of a market that refused to take Moore's Early because it was sour.

PRESIDENT TREDWAY: These discussions, it seems to me, are of the utmost importance to all portions of the state. As to locality, there is a vast difference, no doubt. I have been planting on my ground. The ground is black, and some varieties have failed practically, and I don't know what to replace them with. I have trees of the Maiden Blush variety that have done no good whatever. When the trees were very young they did very well, but as the trees grew older they were inferior in every sense of the word. We have a neighbor growing Missouri Pippin as a choice apple, and he says they have done better in the past year. Like Mr. Snyder, I don't want to plant it; and so I say these discussions are desirable. I don't know yet what to plant.

C. C. COOK: I would say, for Wabaunsee county, Duchess should be added to that list.

DROUTH-RESISTANT VARIETIES OF GRAPES.

By F. L. KENOYER, Independence.

There is no plant, native or foreign, wild or cultivated, that is absolutely drouth-proof. While this is true, yet a variety that could withstand the unprecedented heat and drouth of the last season, and properly mature a crop of fruit, certainly has won the honor of being called "drouth resistant." We have just passed through the hottest and driest summer our state has ever experienced since the white man placed foot upon our soil. In the southeast part of the state there were forty-three days in which the mercury ascended to and above the 100 degree mark, six more

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than in 1901, the year that previously held the record. This heat and drouth were so intense that the vines of some varieties of grapes died outright, and most of the fruit of the Concord, the best known of all varieties, wilted on the vines, and none of it matured without irrigation.

I have an experimental vineyard of thirty varieties of grapes which, for the purpose of discussing them in this paper, I have divided into four classes—the uninjured, the slightly injured, the badly injured, and the ruined. Of these thirty varieties only five escaped injury from heat and drouth, and five were almost totally destroyed, fruit and vine. My vines were all well cultivated and properly pruned. The uninjured vines, as might be expected, were of the Munson hybrid class, except one unnamed variety that is apparently a Tokay hybrid. The Bell, a white grape resembling the Martha in the size and appearance of the fruit, but much better in quality, was loaded down with delicious grapes that ripened to perfection. Cloeta, a jet-black grape the same size and season of the Bell, ripened an equally heavy crop. These two varieties ought to prove a great acquisition to the semiarid region of the West, as it seems that no amount of heat or drouth can faze them. The Bell is extremely hardy, but the Cloeta would likely be a failure north of the center of the state. The Wapanucka, a very large, sweet, white grape, proved its ability to withstand drouth by making choice table grapes of its entire crop, although the berries were not quite up to their usual size. This is one of the very hardy grapes that, with the Bell, should be in every home vineyard in our state. The Fern Munson matured its heavy crop of fruit notwithstanding it is one of the latest sorts in cultivation. Two years ago the trustee of the seventh district, Mr. C. A. Blackmore, of Sharon, sent me a few vines of a grape whose name and origin are to him unknown. On account of its close resemblance to the Tokay in size, shape, color and texture, I think it highly probable that it is a cross between that variety and some very hardy labrusca. Be that as it may, those who are partial to foreign grapes could have their wants gratified in this variety. The small vines received from Mr. Blackmore were set in the spring of 1912. While that year was so dry that newly set vineyards made very little growth, these vines made a growth of ten feet and bore a fair crop of grapes last season. They ripened with the Fern. The berry is much larger than the Concord, oval, pink, as meaty as the Tokay, requires no sugar when cooked, and is sweet enough for raisins. Mr. Blackmore calls it his raisin grape. On account of its color and place of origin, I have temporarily named it Rose of Sharon. The variety may possibly be already listed among the cultivated varieties. If not, and further tests prove it a valuable variety, the name Rose would not be inappropriate. It seems to be worthy of extensive cultivation, and I shall propagate it as rapidly as possible.

In the slightly injured class about half the crop ripened into table grapes, and the rest had to be sold for jelly. Ten varieties come under this list. Named in the order of ripening, they are: Eclipse, Moore, Campbell, Banner, R. W. Munson, Mericadel, America, Doctor Collier, Triumph, and Armalaga. These, together with the five uninjured kinds, making fifteen varieties—just half the list—are sufficiently drouth-resistant to be depended upon for a paying crop any year.

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Of the remaining fifteen varieties, ten were so badly injured as to be fit only for jelly. These were Headlight, Concord, Martha, Niagara, Worden, Manito, Dracut Amber, Perkins, Muench, and Albania. All these should be discarded as a table grape, in my district, although they have some value as jelly grapes.

The fruit of the remaining five varieties—Brilliant, Beacon, Carman, Xlenta, and Manson, all Munson hybrids—dried up on the vines before it matured, and was worthless. These varieties have not sufficient merit to entitle them to a place in the vineyards of our state. I will have no difficulty in getting rid of these varieties, as the drouth has already attended to that job.

I had one acre of bearing vineyard, exclusive of the worthless varieties, from which I marketed 6300 pounds of grapes for $200 gross, or an average of a little over three cents a pound. The intensity of the drouth and the ravages of the birds compelled me to rush the jelly grapes into market prematurely and sell them at two and a half cents a pound, which is from a half cent to a cent lower than usual.

The grapes were not injured by any insect or fungous enemy, although they were not sprayed. During the last few years thousands of vines throughout southern and eastern Kansas have been injured, and in many cases killed, by the phylloxera. Sometimes during the fall of 1911 this insect suddenly disappeared from my district. Its disappearance was no doubt due to the attack of some parasitic insect or fungus, though no one seems to have discovered the cause. None of the labruscas are immune from the attacks of this aphis, not even the thrifty-growing Concord, which was considerably injured and in some cases killed by it. The growing unpopularity of the Delaware and the Campbell, two of the best varieties in cultivation, is due alone to the ravages of the phylloxera. The injury to vines, generally attributed to the drouth, is usually due to this insect. No section of our land is free from the phylloxera, and no soil except almost pure sand is exempt.

To render a vine phylloxera resistant is to make it largely drouth resistant. The most immune and drouth-resistant variety with which I am familiar is the Fern Munson. Last spring I had several hundred one-year plants of the Campbell and Moore varieties that I wished to graft on similar Fern plants to set for a permanent vineyard. My desire was to graft a susceptible Moore or Campbell and an immune Fern together, plant both roots in the same hole, and after the union of two plants had been effected to remove the Fern top and leave the other to be supported by both roots. The two root systems would force the top into a vigorous growth from the start, and in a few years the more vigorous resistant root system would predominate. It has been proven by experiment that weak-growing varieties, like the Delaware and Eclipse, are rendered more vigorous and productive by grafting on stronger-growing roots. I found plenty of instruction in books and bulletins on grafting the grape, but nothing that would aid me in making the kind of union desired. I first tried lip grafting, making an upward cut in one cane and a downward cut in the other, hooking the two lips together and tying in place with twine. I found most of the canes were too crooked, too rough or too brittle to be brought together without breaking, so I discarded that

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method. I grafted some of the vines by cutting a chip off the side of each vine, placing the cut sides together and tying in place with twine. By this method a number of the vines failed to unite on account of the strings failing to supply sufficient pressure or rotting off before the union was completed. I grafted most of my vines by a new method that insures the union of every graft. In one hundred grafts made by this method not one failed to unite. With a sharp knife I took shavings off of opposite sides of one of the two plants to be grafted together. I then split the other plant between two joints, turned the knife blade crosswise to hold the incision open, then inserted the first plant into the slit up to the shaved portion. Then by removing the knife blade the raw edges of the two vines were brought tightly together. The vines were then given two or three rounds of twine and tied with a single knot, although it is probable the wrapping with twine was unnecessary. These plants were set with both roots in one hole, and both canes left to grow the first season. By the middle of the summer every graft of the one hundred had united, notwithstanding the severity of the drouth. I set the point of union below the surface of the ground to prevent drying out. This caused the twine to rot off, saving the extra labor of removing it. Next spring, after growth has started sufficiently for me to distinguish between the two varieties, I shall remove all this season's growth except a single cane of the variety I wish to make the fruiting vine.

Grafted grape vine.

This method of grafting the grape has advantages over all others. It shortens the time between grafting and fruiting one to two years, when compared with bench grafting of cuttings, and the grafts are much more certain to grow. It is the easiest and surest of all methods, requiring neither experience nor skill. By this method an old vineyard can be placed on new, vigorous, phylloxera-proof, drouth-resistant roots without losing a single crop of fruit by the operation. Last year I set one-year Fern vines at the sides of about one hundred old phylloxera-weakened Moore's Early. Next spring I shall split the old vines, insert the new and let nature do the rest. Who knows but that the popular old Concord could be made a better grape in the northern part of our state and fitted to endure the heat of the South and drouth of the West by the easy process of grafting it on the vigorous, deep-rooted Fern Munson?

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C. A. BLACKMORE: I am glad that Mr. Kenoyer had success with that "raisin" grape. I call it a "raisin" grape. I have tried every way to find its name. I will say in some years it will kill back as far north as this, and I had it kill back about two years ago. This year, as near as I can describe it to you, when I gathered the grapes I just drove up and almost shoveled them into the wagon.

F. L. KENOYER: I was struck with the way they passed through the drouth. While other grapes were drying up they stayed firm and as sweet as sugar, almost.

A MEMBER: I would like to ask Mr. Kenoyer how long he has had these Munson hybrids growing.

F. L. KENOYER: About four years.

A MEMBER: You had no trouble with winter-killing?

F. L. KENOYER: I had some trouble.

ALBERT DICKENS: The thought has occurred to me that possibly this grape subject is the most important subject before the Horticultural Society to-day. I can remember a good old German friend of my father's. He said the grape industry would never amount to anything in Kansas because the prohibitory law had passed. But in the last ten years the very great increase in the consumption of grape juice has given the tip to the grape growers that is well worth looking after. The extension of this market for grape juice ought to be pretty nearly unlimited. We have heretofore wondered what to do with the surplus grapes. All know that getting 2 to 2½ cents a pound for grapes looks pretty good, and we have been doing some work at the station testing these varieties for their desirability for grape juice. By the way, that Fern Munson makes mighty good grape juice. With the ordinary process of extracting, we have gotten 75 pounds of juice from 100 pounds of grapes.

F. L. KENOYER: What variety?

ALBERT DICKENS: We have tried the Concord, Worden and Moore's Early more than any others besides the Fern Munson. The Salem makes very fine grape juice. Practically all the grape juice on the market is Concord and Moore's Early. But think of the possibility of using this surplus. It seems to me it is one of the greatest possibilities in horticulture to-day. When they pay 25 cents for a bottle of grape juice, and when we know they are selling thousands and thousands of gallons of Coca Cola, there is no reason, it seems to me, why the grape grower can not put a pint of grape juice on the restaurant table for ten cents and make money on it, if you can get some coöperative way of making this juice. When this is done we have underbidden Mr. Pabst and Mr. Schlitz, and have given the buyers more for their money.

PRESIDENT TREDWAY: Tell us how to take care of that grape juice.

ALBERT DICKENS: No care except to heat it to 180 degrees.

F. L. KENOYER: Does heat destroy the flavor?

ALBERT DICKENS: No, sir; it brings it out; in some cases more than others.

C. A. BLACKMORE: My raisin grape (that is the only way I can designate it, Brother Kenoyer has named it "Rose of Sharon"), that is too good a grape to make grape juice of. My neighbor came and gathered grapes and paid three cents. It deserves to be sold for ten cents.

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PRESIDENT TREDWAY: How do you take care of grape juice, Mr. Blackmore?

C. A. BLACKMORE: My wife attends to that. She just heats it and bottles it up, and it will keep many years.

B. F. PANCOAST: I wish to state that I have two vines of the kinds Mr. Kenoyer ranks as being very hardy, the Fern and the Bell. I wish to state that my vine (Bell) has stood all the cold weather we have had and not been injured. It is about twelve years old, and is a good grower. One season it ran roots about forty feet long in three different directions, and it bore that year about one thousand bunches of grapes. We like the flavor. The Fern is good; it is hardy and an entirely different grape. Very sweet and yet it is acid, and I think juice from the Fern would be the finest flavored juice that they could bottle or can.

PRESIDENT TREDWAY: Do you succeed better with the "long arm" trimming?

B. F. PANCOAST: I have tried both ways, and I think you get more bunches if you trim them long.

Evening Session.

ADDRESS OF WELCOME.

By GOV. GEO. H. HODGES.

Mr. President, Ladies and Gentlemen: It is a pleasure to be here to-night and welcome you to this good capital city of yours and this capitol building of yours. I am supposed to address you upon horticulture, and what I do not know about horticulture would make a big volume, and what I do know about horticulture can be stated in about five or six words, and that is that it brings together in a meeting of this kind the best citizenship of the state.

My knowledge of horticulture is a good deal like that of a friend of mine—a business man, a representative from Wyandotte county. He was in the stock business in Kansas City years ago, and a member of the legislature. I remember we had a bill up for consideration appropriating a certain amount of money for the eradication of the San José scale. The bill passed the senate and came over to the house. I was interested in it, as was also my good friend Stannard. This member from Wyandotte county was a cynical sort of fellow, and every time he voted he would get up and explain his vote. That night when the roll was being called on this bill for an appropriation for the eradication of the San José scale, he rose to his feet and said: "Mr. Speaker, I intend voting for this bill, but I do so against my convictions. We have been using the Howe scales down at our place and I thought they were the best kind on earth." (Laughter.) That is about the same degree of knowledge I have about horticulture; but I am glad to be here and welcome you as a class of citizens who have an industry in this state that is far beyond the magnitude any of us commonplace fellows know anything about. I understand that the product of your orchards amounts to about 90 to 100 million dollars; another gentleman told me to-day about 110 millions

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of dollars a year. That is a greater volume of money than we received from the wheat crop of our great state. This year we have had the worst drouth in our history. I came to Kansas in 1869 in a wagon, drove from Wisconsin to Kansas City and followed the old Santa Fe trail to Olathe. I have lived in Kansas for forty-five years, and I know that we have had the worst drouth in the history of the state; and this year, according to our agricultural records, we raised 86,000,000 bushels of winter wheat. This was 49 per cent more wheat than was grown in any other state in the Union. We are proud of this magnificent wheat yield, but the increased wealth added by horticulture is far greater than the increased wealth added by wheat growing, yet only a very few of the public are aware of this fact. One gentleman advised me he received $12,000 for the apples grown on 12 acres. So horticulture is doing for you and the state of Kansas what few people realize. You are the men and women who are not only making two grains of corn grow where one grew before, but are making good apples grow on little, old, gnarled trees. When I was tramping through an orchard in a neighboring state, we came to a little, old, gnarly, hungry-looking apple tree, filled with little russet apples with warts over them. Up towards the top, probably half way, was a great big limb that had been grafted onto that tree, and that limb extended out four or five feet. It was loaded with those Early June delicious red apples. I remember another time I was tramping through another orchard in the same state. I stepped up beside a crab apple tree, and up towards the top was a limb, and there were great big Pippins on that limb, and I thought, "What is it that man can not do?" Man takes things that nature has created for him, and by his ingenuity, his skill and educated knowledge he makes those things better. When with your expert knowledge of horticulture you graft the twig of a Pippin onto a crab-apple tree, and compel that gnarled, crusty tree that grows an apple that is not pleasing to your taste—when you compel it to nurture that grafted limb, the grafted limb becomes the adopted child of that tree, and the adopted child sends forth better fruit than was bequeathed it by the Almighty—then you are with your wisdom improving upon nature. This is the direct and beneficent thought of studious care and of the wisdom of the Creator of our universe.

If we could forget for a short time, commerce, the striving after wealth and power, and devote some of this energy to the building up of a better society, of a better people, of a more glorious state, we would then, I think, be fulfilling that which the Almighty intended us to do. We have certain classes which, if left alone, drift along in certain channels, and the currents of these channels do not lead to the betterment of the conditions of society. The greatest glory of the state is the universal education of its people, and educated people become a refined, intelligent, cultured citizenship. If we could make our schools so attractive that we could take these urchins who are turned loose upon the street without a guiding influence, who are compelled to shift and hustle for themselves, and direct them in the channel towards our public schools, the public schools would develop in them an ambition to become cultured, refined and better, and one of the growing class that all states desire.

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We spend vast sums of money to improve our wheat, our cattle and our vast industries, but hardly a dollar is laid aside to assist the boy who has been handicapped for want of the proper parental care. We speak a great deal about the conservation of the natural resources. The most vital resources a state has is the younger men and women. The conservation of the boys and girls of this state must become more of a fact, rather than a fancy. If we inspire in the minds of the boy and girl urchins whom we cajole into going to school a broader perspective and a higher view, then we feel that we are fulfilling a duty by grafting into them this desire to become more worthy citizens. When walking through the orchard I referred to, I felt that there was a great similarity between fruit growing and the development of men and women.

I can talk to you about good roads, about the general merchandise business, about country schools, but frankly, I have a painful lack of knowledge concerning horticulture.

It seems to me that in this day of the high cost of living, if every farm would have a small orchard, with small fruits, and if every man in town who owns a lot would prepare that lot for small fruits and fruit trees, we would in a measure be taking quite an advanced step in solving this vexatious problem of life. There is nothing a man can do that will put him in more accord with nature or attune him to the glories of nature any more than to get into contact with nature; and as through the growing of trees, their spraying and the scientific care of them, he sees a reward for his efforts—just so we realize that reward when our boys and girls develop, when their minds become more analytical, more constructive, when we know that then they are able to comprehend more fully what life means to us all. Whenever I see a home surrounded by flowers, a well-kept lawn, budding trees well trimmed, I know at once that the owners of that home are men and women of refinement, of sensibilities and of culture, and even though the floor may not have an Axminster rug upon it, you may rest assured that it will be clean and polished, and that on the shelves of the little library you will find wholesome books, the reading of which brings comfort, peace and tranquillity.

I believe in coöperation, and in coöperation we ofttimes develop specialists. You are intermingling one with the other; here you touch elbows, come in contact with each other, exchange ideas, and form a fellowship that means so much for society and so much for mankind. I remember years ago, when I lived on a farm, sometimes in the winter we had impassable roads. We would sit by the windows in the front of the house, almost yearning and hungering for some one to come along the road—hungering for companionship. By and by some fellow would come along and we would herald him with delight. And so, my friends, one of the great problems of life, it seems to me, is to bear out and carry into society the things that you are trying to accomplish and are accomplishing as horticulturists.

There are two great men in the United States to-day—men who have done more for mankind than any other men. One we call the "Wizard" Edison, and the other that great man, Burbank, of California. It is impossible for me to tell you what he has done. You know more about

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him than I do. Spineless cactus—no stickers on them. I have seen them growing without thorns, and cattle feeding on them. Edison—some call him a "genius," and he is a genius. Wireless telegraph and wireless telephones. But the great thing he has done for this country, it seems to me, is enabling us to get together more upon a common basis—an almost instant exchange of ideas with men far apart—by reason of this wireless telephone he is helping to improve. A man at New York flashes a wireless message to London, three thousand miles away. Something wonderful! something not thought of years ago; commonplace to-day. Years and years ago we would have called that a miracle.

I believe in community centers, in better roads, in better schools, and it should be your purpose and mine to get out and disabuse the people's minds of the idea of this "back-to-the-farm" movement. The back-to-the farm movement is beginning exactly at the wrong end. There is no reason why a man should leave the farm in Kansas. If you have good roads you can send your teams around every day of the year and collect the school children and haul them to school. We should have graded high schools in the country, such as we have in town, and when we have these graded high schools there will be no necessity for the agriculturist to send his children to town to receive an education that they are paying for in the country, but which they are not getting.

We should have community centers, good churches, good roads, and graded high schools. If we could have one graded school where we now have from four to eight district schools, the expense would be far less and we would in a great measure solve this back-to-the-farm movement. Ignorance begets poverty and poverty begets crime. At the Hutchinson reformatory 37 per cent of the inmates can neither read nor write. At our penitentiary 35 per cent have never gone beyond the third reader. It is unfair to you agriculturists or farmers that you should pay your taxes to maintain your country schools, and then if your boy has received a certain degree of education you must go to town to finish that education. When we have better country schools we will have begun to solve the sociological problems. With future mankind in this state, and not only this state, but all over the Middle West, it will not be entirely a question of the gaining of wealth. It is a commendable aspiration to strive for individual wealth, that we may live comfortably, happily, have reasonably sanitary surroundings and enjoy some of the privileges of life; but the question of wealth, after all, is but a minor part of what we are here for. Great wealth is not respected nowadays as it has been in the days gone by. The wealth of good citizenship, of an irreproachable character, of a high standard of ideals, of the moral obligations we owe one to the other—these are greater than a monetary wealth. There is the dawn of a new era, and this new era means more respect for our fellow man and a feeling that we should not criticize in him the offenses we excuse in ourselves; a feeling that his success is our success, that his sorrow should be our sorrow, and that we should help him carry a part of his burden, and if possible make his burden lighter. This new fellowship, this increased humanitarian citizenship, is far more commendable than great wealth. This good state of ours has three billion dollars upon

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the tax rolls, based upon about 70 per cent of the actual cash value of our resources; but I thank goodness that we have hardly a millionaire in Kansas. At the governors' conference in Colorado they were discussing wealth and stating how many millionaires and ten times millionaires they had in their respective states. I got into a sort of a spat with one of them. I said: You have, with those great manufacturing enterprises you boast of, child labor. Mothers carry their little five-year-old babies and set them down at a loom and have them pull out cotton threads all day long—little chaps who can not much more than walk, with their pitiful, half-starved faces and appealing eyes. These little fellows haunt you for days after you see them toiling in their infancy. Yes, you may have millionaires in that immediate locality, made by baby boys and girls. We would despise a wealth in Kansas made by the suffering of mothers and children. Our ideals are loftier than mere money. In this great state of ours we have a more evenly distributed wealth than in any other state. We had two hundred and thirteen million dollars on deposit in our banks in June. That means $125 for every man, woman and child in the state. We do not boast of wealth in Kansas, but we boast of one of the best citizenships in these United States.

The road question is beginning to be a great problem, and while Kansas is incomparably rich per capita as compared with other states, yet our roads are in a more deplorable condition than the roads in any other state in the Middle West, when we take into consideration that we have meager road problems, while Missouri and Arkansas have difficult road problems to solve; and so when we begin to build for humanity we must have better roads, so that we can have better attendance at school, and the building up of community centers, which means greater ideals for our state.

It remained for the Russians to build the first community center of any place in Kansas, and that is out at Victoria. They have a great, big cathedral and they have wonderful schools there. During the summer months there are perhaps five hundred people in the town, but during the winter months they will have two thousand people come to that town to attend the schools and churches. This means much to the right solution of those questions we have been discussing.

I have drifted somewhat from my address of welcome, but you know that you are more than heartily welcome here. I welcome you to this capitol building of yours and to this capital city of yours in this best state in this great nation. It is manhood and womanhood that make Kansas the greatest state, as she is, and in this state of Kansas we have fewer paupers, less penury, less want, than in any other state in the United States. I consider it an honor to be asked to address you, and I trust before you start for your homes you will drop down below in the executive office, and we will be glad to meet you there.

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RESPONSE TO ADDRESS OF WELCOME.

President J. T. TREDWAY.

Governor Hodges, on behalf of the Society we want to thank you for your kind words of welcome to this city, to this State House. It is becoming a very common factor for the horticulturists of Kansas to come to Topeka, largely because of the hearty welcome we receive. We have not come in so great numbers this session, perhaps, as formerly, but there are some few reasons for that. The horticulturists have become somewhat discouraged, but by no means cast down, and we expect to come again and again as long as you give us such a welcome to meet with you, confide with you, ask for your advice, and bring new thoughts that we have learned in our orchards and in our homes.

Kansas has more than 12 millions of fruit trees. If we could grasp that number, realize what it means! It is an enormous thought, if we could grasp it. Governor, Kansas has about 6000 acres planted to vineyards; and I want to say these figures are by our local assessors, and I am very well content to know that they are by no means exaggerated. Yearly we raise a great many bushels of fruit to be distributed to the people of Kansas and elsewhere. The East is eager to take our fruit. We have here (on table) a sample of the display in the secretary's rooms. We invite you to the secretary's rooms. They are but samples from the various orchards.

You realize we are not doing our whole duty in educating the people in raising fruit in the proper way. It comes to my mind that at the last legislature the appropriation for this annual meeting was thrown out by the committee, but reinstated by the legislature. We are sorry for that fact, but it is a fact. It seems to me the people need education. Recently I was down in Leavenworth county, in the country around Bashor and Tonganoxie, and in the neighborhood where our beloved former president, the late Judge Wellhouse, planted large orchards. His orchards are practically gone, but there are other orchards standing there—bleak, barren, unkempt, uncultivated and neglected, all on account of the lack of some education along proper lines. The weeds I saw in many of them were 10 or 12 feet high. The trees were unpruned. There were very few apples this year, they told me. Last year the ground was literally covered with apples and they were not shipped away.

The Agricultural College has done great work to the extent of the funds it has had. The governor spoke of the appropriation for San José scale, and I am inclined to believe the story he told. The legislature did make a small appropriation for the San José scale work, but if they could have been induced to give us ten times that much for the work of the Entomological Commission we could have eradicated many more pests and depredators than has been done at this time. It is true, we had at that time San José scale, Governor. I sent word to Professor Dickens, and we found it was positively there. That was three or four

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years ago, just after the Entomological Commission was organized. Professor Hunter followed it up that year and the next, and after that we failed to find any more San José scale. It was done, perhaps, by that very appropriation of which the governor has spoken.

If we could have the funds for the secretary, if you please, or the headquarters of this society to send out speakers to the county meetings of the state to instruct and encourage them in their work and discussions, it would be an education that would do great good. There are many counties that have horticultural organizations. We have one, and many other counties have. Only two delegates are allowed to come and have a vote in this organization. This is one reason our numbers are small, but if speakers could be sent down from these headquarters occasionally it would be a great education to the people and we could grow in "grace" and in the nurture of better horticulture.

So, Governor, we thank you for those beautiful words of welcome, and we would be glad if you could meet with us again and again and aid us by your presence and by your words of encouragement. I thank you. (Applause.)

"JONES."

By Prof. Merle Thorpe, Lawrence.

You will agree with me at the outset that there is nothing romantic about Jones, or a batch of sausage, yet what I am about to say is pure romance.

Jones was a farmer's boy. His father died, leaving him to support his mother. Maybe the farm was mortgaged, I don't know. But I do know that Jones had the use of neither arms nor legs. They were tied up in knots by rheumatism.

To the young man and his mother the future had hope of little else than a hand-to-mouth struggle.

A neighbor dropped in to sympathize, and in blundering fashion expressed regret that he would no longer enjoy the batch of sausage Mr. Jones had given him each winter for so many years. He was very sorry.

Jones thought of that sausage after his neighbor had gone. His father had made good sausage. Every one admitted it. And as the young man sat looking out of the kitchen window, from the jumble of impressions —necessity, sausage, good sausage, demand—the thought struck him: Why not make his father's sausage and sell it?

Jones could not walk, he could not use his hands, but he knew how to direct the making of good sausage.

Again, the necessity of finding a market, of selling his product, bewildered the bed-ridden Jones. And again, from the jumble of impressions the second solution crystallized: Why not tell the neighbors of his plan through the county newspaper?

A thirty-cent notice in the county newspaper told 800 families that the Jones sausage could be bought and that the Jones sausage would be as good and honest a sausage as man or woman could make.

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Customers bought all the sausage that winter that Jones and two hired girls manufactured.

The next year Jones sent his salesmen—his little newspaper notices—into surrounding counties, and made more sausage. He sold it all. Then he paid the Milwaukee and Chicago papers to sell his sausage. And they did.

That was several years ago. To-day Jones's Dairy Farm Sausage is sold in every state in the Union, and in Canada and Mexico as well. Jones is rated in seven figures.

As Jones sat propped up in his invalid chair he used to look at each pound of sausage and say: "Mr. Sausage, you are honest. There is not a single dishonest constituent about you. You are worthy of the confidence of the people. You stand for the best there is in me and in every man in the shop."

Another thing: Jones, though a farmer, had sense enough to use the big tool big men everywhere use to sell their goods. He appreciated the economic position of the modern newspaper. He was big enough intellectually to place himself with the successful merchandizers of his day. He did not make good sausage and expect his customers to sell his goods for him. He hired a salesman—a thirty-cent ad.

Still another thing: Jones was proud of his product, and gave it a name—Jones's Dairy Farm Sausage. He made it easy for customers to call for his sausage. "Jones's Dairy Farm" was his trade-mark. It is registered in Washington, D. C.

I don't know how much those three words are worth on the market; I doubt if $500,000 would buy them. Some one wanted to buy the word Sapolio and the owners asked a half million a letter; $7 \times \$500,000 = \$3,500,000$. Three million and a half for a single word.

But it's worth it. If the Fairbanks Company should go out of business to-morrow and not manufacture another cake of Sapolio people would keep on calling for it at their grocer's for twenty years. Advertising turns a trade-mark into good will. Maybe this is why expert accountants to-day are placing the money spent by a firm for advertising in the *investment* column, no longer in the *expense* column.

There is a Jones in each community in the state of Kansas. Maybe he can't make sausage; maybe his long suit is raising chickens, growing apples, or making butter. But if he can raise better chickens, grow better apples, make better butter than his neighbors, the world will beat a path to his door, provided, he is smart enough to take advantage of this great selling force—advertising. Judicious advertising in his local paper will not only inform his neighbors of his wares, but will sell them for him, create a steady demand, and make his trade-mark worth real money.

In 1759 Dr. Samuel Johnson wrote in his weekly *Idler:* "The trade of advertising is now so near to perfection that it is not easy to propose any improvement."

Dr. Johnson's paper carried advertisements announcing a new shipment of tea from Ceylon, and a new book in the stalls.

In 1912, hard-headed men, devoid of sentiment, spent one billion dollars in advertising in the United States.

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Corporations, banks, churches, cities, universities, and governments, are utilizing this economical salesman, printer's ink.

And while "it is not easy to propose an improvement," it looks as if farmer Jones would be the next to appreciate and harness this giant of business expediency.

There is another tale, about an onion, which, like the batch of sausage, had no claim on romance until a man with brains came along.

It was brought from Bermuda by a Texas farmer named Nye, who discovered that it would grow in semitropical southern Texas even better than in Bermuda.

For several years Nye and his neighbors sent their onions to market where they brought the highest of prices. This fact leaked out and there was a rapid increase of acreage. Southern and southwestern Texas became known as the Onion Belt. Onions were netting the farmers as high as $1000 an acre.

Then the inevitable. There was a gorge. Markets were glutted. Prices shot downward and ruin threatened. One way out; and that was to increase the consumption. Here's romance; teach a nation in thirty days to eat onions!

The advertising man would sniff at calling such a task romance. He would contend that it was pure realism, an everyday occurrence, and would ask who taught a nation to cook without fire, to sweep without brooms, to make music from a disc, to add up figures by machinery? Who fitted us to ready-made clothing? Who revolutionized our breakfast table? Who popularized automobiles? Who trained a nation to new labor-saving, time-saving, money-saving desires? Who raised merchandizing standards to a high degree of honesty? Who taught the customer to look for quality, and how to know quality when he sees it? But let me finish the tale of the onion.

The farmers met and appointed a committee to teach people to buy and eat Texas onions. This was in March. There was little time to save a million dollars' worth of onions.

You have seen the copy of the Southern Texas Truck Growers' Association. It appeared in five issues of the *Saturday Evening Post*, two of the *Country Gentleman*, two of *Good Housekeeping*, and one issue of the *Ladies' Home Journal*, during April and May.

The advertisement said, "Here's an onion without the sting." It told of an onion, mild, sweet and crisp, without that strong flavor; there was an appetizing picture of a planked steak, surrounded by onions, Parker House style; it offered to send a trial pound direct from the grower by parcel post for ten cents.

There were 20,000 replies. The first day's mail covered every state in the Union and every section of Canada. The largest mail in any one day was 750 letters. Although the last advertisement was run in May, replies were coming in July and August at the rate of from ten to fifty a day.

The association began returning ten cent pieces early in July. The onions were all sold.

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Thousands of second letters were received asking for brokers' and jobbers' names. And hundreds of anxious grocers wrote for crates of onions because housewives were demanding and refusing to be fooled by substitutes after having tasted the samples.

The advertising, which is so generally regarded by small merchants as fine for the big fellow, will do all this for Farmer Jones and his sausage, and for Farmers Jones and their onions. Maybe there is work for it to do for the Joneses in Kansas.

While farming in Kansas is at a high level, the Kansas farmer is overlooking one opportunity that is being taken advantage of in the New England states.

The Yankee farmer is not only using his local paper to advertise his special sales, but carries a persistent, week-after-week advertisement of current produce.

This gets him regular customers in the town and he makes twice-a-week or weekly deliveries of butter, eggs, chickens, and other forms of produce. He is also enlisting the rural telephone and the parcel post.

At the same time he is telling his neighbor farmer what stock and produce he has to sell and is in turn learning what his neighbor has on the market.

A thirty-cent advertisement is cheaper than paying the middleman trader his profit.

Farmers of New England find it profitable to tempt the city man and neighbor by displaying fresh produce in the newspaper column; is there any reason why Kansas farmers should not do likewise?

You are familiar with the history of the Sun-Kist orange of California. This orange was put into every state in the Union after a group of farmers got together and decided to use printers' ink.

The Wenatchee apple, the Hood River apple, the Yakima apple; all owe their popularity to-day to advertising.

Now, I don't pretend to know anything about horticulture. I have, however, one or two ideas about publicity—my own line of work. You have Professor Hunter of the University and Professor Dean of the Agricultural College, and you can ask them to work out some particular means of handling these ideas.

I have been wondering if the farmer orchardist could not utilize printers' ink to advantage. I am wondering if the fruit grower could not insert an advertisement in the country paper and tell people what he has to sell. The first thing he would have to do would be to name his farm. The second "to deliver the goods." If he raised good apples and gave them a distinctive name, I believe judicious advertising would sell those apples for him at top prices. Make the name or trade-mark stand for the best apple that is grown. Maybe the community idea might be worked out. Orchardists might get together and market their produce by means of printers' ink. I should like to see Kansas apples put on the market just as Wenatchee apples and Sun-Kist oranges have been put on the markets of the United States.

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Teach the people of the United States to eat an apple a day. You know the old proverb, and it is a good one (I will vouch for it from personal experience); the old proverb which runs:

"An apple a day
Keeps the doctor away."

There are business offices in New York city that house 2500 men, a good-sized Kansas town. Teach the men in those offices to buy an apple in the morning for luncheon. Is this problem any more romantic than teaching those same men to eat onions or to buy sausage from Fort Atkinson, Wis. It can be done, and the success will go with those enterprising orchardists who first harness this giant of business expediency, printers' ink.

WHAT DONIPHAN COUNTY HAS DONE WITH APPLES.

By J. H. MERRILL, Manhattan.

I have taken this subject because it seems to represent a typical history of fruit growing. This industry in Kansas is comparatively young, yet it has passed through all the stages of apple growing.

The history of orcharding in this county may be divided into three periods. The first period was that in which, because the country was new, there were no orchard pests; in the second period these pests appeared, but nothing was done to control them; and it was in the third period that efforts at control were made.

During the first period there were no large commercial orchards, yet nearly every farmer had a few apple trees which produced enough for his use. The next step came when one or two men, more venturesome than their neighbors, did set out large orchards. The owners of these orchards were well paid for their investment. The result of their success was that there were many large orchards planted. During the first period, owing to the absence of orchard pests, good fruit was raised. Orcharding then was simply a question of planting out the trees and, in due course of time, harvesting the crop. If the yield was heavy it was looked upon as pure gain, while if there was a crop failure, no feeling of loss was experienced, as no expense had been incurred in handling the orchard. Even though good apples could be grown, the orchard was at first considered distinctly a side issue.

The largely increased area of orchard planting was one of the direct causes in bringing about the second or pest period. Hitherto, when the orchards were few and isolated, there was but little opportunity for pests to spread from one orchard to another, but as the size and number of orchards increased, the opportunity for spreading was made possible. As the orchards grew older the pests within them, which at first were so few as to cause no apparent trouble, began to multiply, and increased to such an extent that the damage they caused annually became disastrous to fruit growing. Some of these pests were not even in this country during the first period, but have since been introduced; the San José scale is an example of this.

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While the pests were gaining their foothold the public was becoming educated in the matter of selecting fruit. Inferior apples could no longer compete in the market with the high-class fruit raised in those parts of the country which specialized in apples.

Each succeeding spring would find the trees in full bloom, but a very small percentage ever reached maturity, and the result was that one crop failure followed another with discouraging regularity. It finally became evident that the land now in orchards could be more profitably devoted to raising other crops; consequently, hundreds of acres of orchard in this country were cut out. In making a land sale an orchard was considered an incumbrance, and the cost of its removal was often deducted from the selling price.

The third period commences at a rather recent date. The first work was begun in Doniphan county, upon the discovery of San José scale, at Wathena.

While there is in Kansas a state law making spraying for scale compulsory, better results can be obtained by awakening an interest in orcharding in general. The crusade, as it might well be called, to arouse an interest in good orcharding has not always been an easy or a pleasant one. At first it met with a stone wall of skepticism, but finally a few orchardists were persuaded to practice modern methods. Their results were most satisfactory, and they became thoroughly convinced of the value and necessity of spraying. These few were followed by many, until now there is hardly a person in that county who does not believe in spraying.

The man who sprayed his orchard raised better apples than his neighbor who did not spray, but even he realized that spraying was only one of many problems which concern orcharding. The next natural step was pruning. These old orchards had seldom, if ever, been pruned. In fact, pruning was considered by many as almost a heresy. After pruning, other orchard problems were taken up and dealt with as live issues. During the winter of 1912 the Doniphan County Horticultural Society was organized for the purpose of bringing the growers together that they might discuss the present as well as future problems of growing better fruit.

Thus it will be seen that the orchard, which was at first considered a side issue, then later as an incumbrance, has finally come to be the best-paying acre on the farm.

The summer of 1913, as every one knows, has been a hard one on all living things, but it had its value in that it demonstrated very clearly the advantages of modern methods. Those who did not spray their orchards had no apples at all, while those who sprayed made good money.

I will give the facts and figures of the results from some of these orchards for 1913. I have not included all of those who were successful, because the list would be too long. The year 1912 was a big apple year, Doniphan county shipping 202,240 barrels of apples, consequently a small crop was expected this year. It is for this reason that the results of 1913 are the more remarkable.

Mr. Geo. T. Groh is one of the pioneers of modern orcharding in Wathena. Together with his uncle, Adam Groh, he purchased a power

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sprayer in the spring of 1912. A severe hailstorm badly damaged his apples, yet the quality of those remaining was so good that he received $1670 for the crop from 550 trees. His best previous yield had been 750 bushels of bulk. In 1912 he had 4200 bushels of sound fruit and 2000 bushels of bulk. In 1913 he received $3386.11, which would make $6.09 per tree, or $300.45 an acre.

Adam Groh received $2067 from 450 trees, or $229.66⅔ per acre.

George Groh leased two acres of orchard from another uncle, agreeing to spray it for one-half of the crop. He paid his uncle $218.31 as his share of the crop. This would mean $109.16 per acre for the lease.

Mr. P. A. Pettis, of Wathena, received $88 for his apples in 1911. In 1912 he had a large crop, which he sold as bulk for $1000. In 1913 he purchased a spraying outfit, but secured it too late to apply the first spray, and later was prevented from putting on the fourth; yet he received $700 for his crop, which he himself says is just about $700 more than he would have had if he had not sprayed. Had he been able to follow the complete schedule he no doubt would have made considerable more money than he did.

Mr. W. D. McClellan, of Blair, has 720 trees. In 1910 they yielded about 10 barrels. In 1911 there were about 1100 barrels of bulk, and rather poor bulk at that. This crop sold for $1060. In 1912 he had 75 barrels, which brought him in $36.30. In the spring of 1913 he bought a power sprayer and sprayed his orchard, with the result that he received for this year's crop $2900, or $4.03 per tree.

Mr. Frank Kotsch, of Troy, has been spraying his 25-acre orchard for three seasons. Last year his apples brought $8070, and this year he received a little over $3000, making a high average yield per acre for the past two seasons.

Mr. Lawson Mann, of Troy, is another man who commenced spraying this year. In 1911 there were but few apples in his orchard. In 1912 he received $408. In 1913 he received $1250. This past season is the first time that Mr. Mann ever had apples that were better than bulk.

Mr. F. A. Kinzey, of Troy, did not get anything from his orchard in 1911, but had a bumper crop in 1912, which he sold for $1265. In 1913 he began spraying, and this fall sold $3000 worth of apples.

The story of the orchard belonging to G. Foster Kent, of Troy, is an interesting one. This orchard produced, in 1910, 800 barrels of bulk apples, which was the best crop it had ever borne. In 1911, although the trees bloomed well, only about $80 worth of fruit matured. In 1912 it was sprayed for the first time and produced 4600 barrels, which marketed for about $6000. In 1913 Mr. Kent received for his Jonathans $1119.40; Ben Davis, $4175; total, $5294.40.

In 1912 Mr. Bauer, of Wathena, bought the apples from both the Drosselmeir and the Groh orchards. He paid the Grohs $3700 for their apples, and for the Drosselmeirs' $275.80. He was so impressed with the value of spraying that he leased the Drosselmeir orchard for five years. He sprayed it this summer and received ten times as much from his crop as he paid for last year's yield.

In the first period good apples were raised; in the second, although the trees bloomed heavily enough, the orchard pests prevented good

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yields; in the third period apples were again produced in paying quantities. During all three of these periods nature had done its share of the work, and all that it asked was for man to do his.

The orchard pests have proven themselves to be a blessing rather than a curse. As long as one could plant the orchard and reap the harvest the idea never occurred to him that his orchard needed any care whatever, but when the presence of the pests forced him to purchase spraying outfits and spray materials, then he began to think about making that orchard return all the money possible to him. A well-pruned tree will not use up as much spray material, there being no dead limbs to be sprayed. When he came to prune his trees he noticed for the first time the presence of canker, and set about remedying this. It was also noticed that some trees were not making the growth others were. Upon investigating this trouble he learned how to feed his ill-nourished trees. These are but a few instances of the good that orchard pests have done for fruit growers. They made the fruit grower acquainted with his own orchard and taught him to consider its possibilities as a paying proposition and to realize that it was something else besides a mere collection of trees.

PRESIDENT TREDWAY: I would like to say that there are one or two questions on the secretary's desk that were handed in for answer, and if there are any questions that you would like to ask pertaining to horticulture we will try to have them answered. This is your meeting. We want you to feel free to use it. We want your advice. Give us your encouragement and aid. Bring in your questions and we will try to have them answered. We expect to have some members here to-morrow that are not here to-day.

J. J. ALEXANDER: It seems to me that the last two gentlemen on the floor have made a great point in this horticultural meeting. They both gave us something, and we have n't said anything in appreciation of it. One of them spoke of advertising the horticultural interests—the fruit we have. Now, I want to say, if you will go out and get a few carloads of apples from somebody who wants to sell, you will see few apples that have not been stung. That is n't the kind of trade-mark we want. The other trade-mark would be much better. I think this Horticultural Society ought to show its progressiveness by recommending that the trade-mark be better fruit. Let us have cleaner stuff and better prices. You can take an apple that is 60 cents a bushel or 75 cents a bushel, and one at $1.25—bulk apples. The one at $1.25 is the cheapest. I do think there ought to be some law or some means by which this worthless stuff could be kept off the market, and our trade-mark should be apples without worms.

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SECOND DAY—Morning Session.

PRESIDENT TREDWAY: The society will be in order now. Will the society please stand while Rev. M. F. Troxell, of the First English Lutheran church of Topeka, offers the invocation.

PRESIDENT TREDWAY: The time has arrived for reports of officers. I would say to you, delegates and members, that the president has prepared no report. I feel that you have had some discouraging circumstances during the past year, but that you are in no sense cast down.

I do not know but that the oppressive heat of the past year has brought its blessings as well as its disasters to us all. It seems to me, in my little stock of experience and knowledge of horticulture, that there will be a greater incentive to the propagation of fruit in the future than in the past because of what we have learned in the severe season just past. Many have said to me that they are going to set orchards. Others have said, "Many of my old trees have been killed, and I am glad of it." Two men in my community said, "We will uproot the whole orchard and plant new." Those who have raised the smaller fruits have determined to persevere and extend their plantings, and it has brought to us many things—what a severe drouth and hot season can do to us, and, as I say, it has brought its lessons.

I am not a fruit-tree agent, but many of my neighbors have appealed to me to send for trees, and last spring I shipped in perhaps 800 or 1000 trees. I do not act as agent. I simply ship them in and they pay the price to me that I pay the nursery. Many have already appealed to me this fall, and up to this time the orders have amounted to 1500 trees. It means, I think, that the people are going to plant more trees. Not in a commercial sense. We have very few commercial orchards, and I believe the time is coming when we must depend on the individual farmer more than on the commercial orchardist for our fruit. There is a great demand for our fruit in the East. Coöperation is one of the essentials. I believe it is coming. Coöperation of the fruit men and a better control—if I may use that word—better control of the railroads for the purpose of shipment. There are orchards in the northern part of the state that I have visited recently where much of the fruit was rotting on the ground, simply from the fact, they said, that it would cost too much to transport it. The time is coming when societies, horticultural and others, will coöperate, and we will get rates which will permit us to ship this fruit at a profit. There are millions and millions of trees growing in our great state, besides the small fruits and the garden, and there will be a market for it all. If we were all Holsingers and Dixons we might know better how to handle this matter.

We should not be discouraged, I think, but rather go forward with greater determination than in the past. In my home orchard, planted in 1880, of course, being a stranger to the country, climate and soil, I very naturally set those fruits I loved in Ohio—Rome Beauty, Rambo, Bald-

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win, Northern Spy. Those apples were all a failure. I have never had the nerve to cut them down, but I am going to eradicate one orchard completely; no matter if it is a good healthy tree, I am going to take it out, and we are going to plant new on the same site. I would like to change the site, but it is not practicable to do so. So we will eradicate the old orchard, believing that we now know better the kinds of fruit to set. This year we lost less trees than before. The last Ben Davis tree I set out was loaded with fruit, and died in that condition, with the fruit unpicked. Every Ben Davis tree that I had died. It was largely our fault; and yet those trees were a little more than twenty years old. I believe the age of a Ben Davis tree is eighteen to twenty years. Nevertheless, I will set more Ben Davis.

I will say, somewhat apologetically, that I prepared no report. I did n't know just what kind of a report to prepare.

Now we will have the report of the vice president. I presume he has prepared an excellent report to submit to the society.

B. F. SMITH: I will say, as I said yesterday afternoon, we have had the best reports we have ever had for thirty years.

REPORT OF VICE PRESIDENT.

By B. F. SMITH, Lawrence.

The season of 1913 was one of unusual climatic conditions. The spring was dry until about the middle of May, after which we had a few light showers. Toward the last of the berry-ripening season it was very dry with several days very hot for May, which reduced the output of strawberries to less than three-fourths of the yield expected by the growers of Douglas county.

The continuation of the heated spell shortened the raspberry crop at least fifty per cent. Near the close of the raspberry season we had a light shower which saved the last picking. Blackberries suffered even more than the raspberry crop.

The hot weather continued with us through July and the greater part of August, seriously injuring all the orchard fruits. Apples, peaches, and pears were not more than half the usual size, owing to the need of moisture.

Notwithstanding the smallness of the fruit, apples in orchards that were sprayed were clear of insect blight, and they sell for from 75 cents to $1 per bushel.

Peaches were but little over half the usual size, and the earlier and mid-season varieties did not bring the prices hoped for. The later sorts, Globe, Smock, and others, brought better prices.

There was about seventy per cent of a crop of cherries. The home demand was above the supply around Lawrence. There are several young orchards that will soon come into full bearing, and then we hope to have enough to satisfy the demand for cherries.

There was about 25 per cent of a crop of Duchess pears, and 10 per cent of the luscious Seckel. The Howell, Anjou, and Sheldon were a failure. There was about 40 per cent of a crop of Garber and Kieffer.

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Now the question uppermost among our apple growers is, How shall we manage our orchards to get apples that will satisfy the consumers? We must cultivate our orchards better than we have been doing, and of course spray as often as necessary. Again, we must keep abreast of the times in testing new varieties that may be more attractive and of better flavor.

Then, owing to uncertainties of our climatic conditions, we can not afford to plant large acreages of orchards or berry fruits. Small orchards, well planted and kept in perfect condition, will pay in a run of five years, as well as an alfalfa or grain farm. Many of us, in the past twenty-five or thirty years, have not been satisfied with sure things, we wanted to speculate and get rich at a jump. We have been estimating that if five or ten acres would yield a profit, five or ten times that acreage would soon enable us to retire or go to California to spend the winter seasons.

I maintain that we can not grow strawberries or raspberries for less than $2.50 to $3 per crate if we would make an even race with dairy, stock, and grain farmers.

Some should have advice in our respective localities, about what we can sell, either in our local or our out-of-state markets.

Notwithstanding the unfavorable seasons that come to us the fruit growers of our country are hopeful, and we have a live Horticultural Society, that holds monthly meetings with a good attendance. Our association is the oldest fruit growers' society in the state. It was organized in the winter of 1867. The founders have all gone to their reward, but the work they loved still lives in the hearts of our people.

It is the desire of the writer that the old first Horticultural Society of the state of Kansas shall live at least until 1917, when we will have a great anniversary feast, to which we will invite the State Horticultural Society.

SECRETARY'S REPORT.

By WALTER WELLHOUSE, Topeka.

The indications early in 1913 showed a fair to good prospect for a yield of fruit throughout our state. The peach prospect was lowest, with grapes best. Apples promised a good half crop.

This prospect was very materially reduced by September, by the unprecedented high temperature and lack of rainfall during June, July and August.

The United States Weather Bureau makes the following comparison of these three summer months with the same three months of other seasons as regards temperature and rainfall:

Years.	Mean temperatures. Degrees.	Total precipitation. Inches.
1901	80.5	6.85
1911	78.5	8.38
1913	80.2	4.24
Normal	76.2	11.32

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This shows that the rainfall for 1913 was 2.61 inches less than for the same period in 1901.

Our June fruit crop report for the state is here compared with the June report for 1912:

	June, 1913. Per cent.	June, 1912. Per cent.
Apples	53	71
Pears	40	66
Peaches	26	53
Plums	41	60
Cherries	64	70
Grapes	79	73
Strawberries	70	68
Raspberries	70	54
Blackberries	69	46

Tree fruits, although not showing as large a yield as last year, were generally reported in good condition. More spraying was being done than usual. Small fruits were more plentiful than last season and the quality was reported as fine where the rainfall was sufficient.

The prospect was very materially reduced during the season, and our September report showed, as compared with September, 1912:

	September, 1913. Per cent.	September, 1912. Per cent.
Apples	22	65
Pears	20	73
Peaches	17	50
Grapes	35	73

This shows a decline from the June report of apples, 31 per cent; pears, 20 per cent; peaches, 9 per cent, and grapes, 44 per cent.

The following gives the yield of fruit for 1912 in bushels, crates and baskets:

Apples, bushels	$4,827,789
Pears, bushels	160,887
Peaches, bushels	644,735
Plums, bushels	54,549
Cherries, bushels	76,283
Strawberries, crates	119,723
Raspberries, crates	34,872
Blackberries, crates	43,764
Grapes, eight-pound baskets	643,462
Value of all fruit	$3,014,862
Value of all garden products	284,777
Total value of horticultural products	$3,299,629

The following counties led in yield of fruit:

Apples (bushels): Doniphan, 554,755; Leavenworth, 377,354; Reno, 294,636; Atchison, 279,138; Brown, 248,124; Wyandotte, 227,097; Nemaha, 204,485; Jefferson, 165,985; Douglas, 154,520; Sedgwick, 132,131.

Pears (bushels): Douglas, 13,122; Labette, 9386; Wyandotte, 9018; Reno, 6527; Sedgwick, 6343; Jefferson, 5870; Doniphan, 5831; Miami, 5345; Leavenworth, 4741; Atchison, 4656.

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Peaches (bushels): Reno, 41,479; Sedgwick, 30,920; Cowley, 24,732; Dickinson, 22,382; Nemaha, 21,204; Osborne, 21,028; Stafford, 19,938; Smith, 17,343; Sumner, 16,782; Butler, 15,953.

Plums (bushels): Wyandotte, 7634; Kingman, 2081; Doniphan, 1685; Reno, 1502; Johnson, 1432; Sedgwick, 1311; Douglas, 1299; Phillips, 1152; Miami, 1130; Shawnee, 1041.

Cherries (bushels): Wyandotte, 12,769; Wabaunsee, 6034; Johnson, 3464; Nemaha, 2696; Shawnee, 2618; Jefferson, 2530; Douglas, 2285; Doniphan, 2260; Atchison, 2199; Brown, 2161.

Grapes (eight-pound baskets): Wyandotte, 117,880; Doniphan, 110,490; Reno, 35,850; Sedgwick, 18,987; Nemaha, 15,672; Jefferson, 14,966; Atchison, 12,925; Lyon, 12,862; Montgomery, 11,285; Harper, 11,069.

Strawberries (crates): Doniphan, 75,828; Cherokee, 6274; Atchison, 3391; Douglas, 3180; Wyandotte, 2659; Elk, 2233; Leavenworth, 1739; Johnson, 1609; Bourbon, 1565; Jackson, 1534.

Raspberries (crates): Doniphan, 24,220; Wyandotte, 1708; Leavenworth, 914; Atchison, 843; Johnson, 641; Shawnee, 639; Cherokee, 609; Douglas, 392; Jackson, 389; Coffey, 306.

Blackberries (crates): Doniphan, 29,142; Cherokee, 2948; Atchison, 1862; Crawford, 1059; Wyandotte, 936; Marshall, 620; McPherson, 479; Cloud, 471; Sedgwick, 457; Neosho, 415.

Appropriations, and the appointment of your secretary as a member of the board of state fair managers, was the only legislation enacted by the legislature of 1913 concerning horticulture.

The following members of our society have passed from this life since our last meeting: E. B. Cowgill, G. W. Collings, Francis Goble, L. F. Miller, Prof. T. V. Munson, Prof. E. A. Popenoe, Carl Richter, and Prof. B. B. Smyth.

REPORT OF TREASURER.

By Edwin Snyder, Topeka.

July 15, 1913.

Received from O. F. Whitney, former treasurer, $525.75.

We have audited the secretary's and treasurer's accounts and find same to be correct.

F. L. Kenoyer,
B. F. Pancoast,
J. B. Myers,
Committee.

REPORT OF OFFICIAL ENTOMOLOGIST.

By Prof. S. J. Hunter, Lawrence.

Mr. President and Members of the Society: I do not feel very old, yet I believe this is the seventeenth year I have stood before this society to talk about the problems in which we are all interested. The first meeting I attended here I laughed at some of Edwin Snyder's stories. I am very glad he still lives and is able to tell stories with his usual aptness.

It is gratifying to see some of the younger blood coming in from time to time, men who are going into this thing for a life business.

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Our work as you know, up to 1907, extended to all parts of the state. At that time the Entomological Commission was created. This divided the state. Our work is confined, therefore, entirely to the southern half, our colleague, Professor Dean, having been assigned to the northern half. This law has proven so satisfactory that it has but recently been put upon the statute books of Oklahoma. They had a law down there placing the work in the hands of the Department of Agriculture. That law was repealed and our law was substituted for it. You ought to know that the federal law which was enacted a year ago becomes a part of our commission law as soon as its enactment enters the state. That is, when the law was being considered, the question of how the law was to be administered was brought up, and an attorney for the Department of Agriculture said it would have to be administered in conformity with the different state regulations as they are. It would have been very convenient for the United States to have used its own machinery in each state, but they found that could not be consistently done.

The work of your entomologist in relation to horticulture in this state, and therefore in relation to this society, may be divided into the following lines:

1. Nursery inspection.
2. Federal inspection of all foreign imports as collaborator for the United States Department of Agriculture.
3. Experimental work on orchard culture and management.
4. Remedial measures against San José scale.
5. Answers to inquiries from members of this society and other Kansans interested in horticulture.

Without taking up your time to read the whole report, by your permission I will discuss informally with you parts of the reports, particularly that with reference to orchard culture and management, and beg leave to print the full report for perusal later.

NURSERY INSPECTION.

As shown by the summary, the unusually dry year reduced the number of nurseries, and also the number of acres.

FEDERAL INSPECTION.

This society, as you all know, does not contribute any funds to the work of the entomologist for the state. For several years past the legislature has appropriated to the Entomological Commission funds sufficient to conduct the work adequately. On July 1 of this year the fund closed, so that remedial measures for the fall and winter had to be largely abandoned, and the small fund which had been given devoted toward protecting the state against the establishment within its borders of such insects as have already become a serious menace in the eastern part of the United States.

In fact, had the University of Kansas not appropriated out of its funds about three times as much as that given by the legislature to the Entomological Commission for this work, we would not have been able to have followed out this work as completely as we have.

By reason of the fact, therefore, that the Entomological Commission and this society are officially associated with the State University, has it

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been possible to conduct this work as has been done. In other words, had the commission or this society been unattached, that is, entirely dependent on special appropriation by the legislature, the work of this year and the year following would have had to be in a large degree suspended. From the accompanying summary, however, it will be seen that the work is going on as usual.

EXPERIMENTAL ORCHARD WORK.

The state of California, for some reason, saw fit to include Kansas in its quarantine area on account of Peach Yellows and Peach Rosette. It became necessary therefore to make a detailed survey of the peach-growing area of the state to determine whether the state of California was justified in maintaining this quarantine. The result of this was that not a single case of existence of this disease was found in the southern half of the state and after considerable correspondence we were able to have the quarantine raised, a thing in itself of much interest to the horticulturists of the state, permitting them to ship fruit and nursery stock without hindrance.

This year the entomologist took charge of the experimental orchard work and under his direction it was managed through a competent superintendent, Mr. L. A. Winsor. About this I am going to speak to you at some length extemporaneously but will record the results briefly.

The method of spraying was the same as the year before and the beneficial results were as good.

The unusually dry year called for frequent discing and this kept the apples on the trees, whereas in adjoining orchards not so disced the apples fell. The results of discing in an orchard were never more apparent than this year since the apple crop was the lightest for several years past and the fruit continued to grow much longer in the fall than usual.

On five acres we raised something in excess of twelve hundred bushels; not a bad crop for such a dry year.

SAN JOSÉ SCALE.

It is a matter of no small regret to your entomologist that we were forced to discontinue the vigorous campaign which had been carried on the past two years against this injurious insect, but in the thirteen counties where the scale had been found, and in which it was necessary to make surveys from time to time, and with foreign countries shipping in new insects liable to be of large economic importance, the problem then became how best to use the small fund at our disposal. The commission had a small fund and to this the University added about three times as much.

With this we have been able to inspect all incoming shipments and to coöperate with those who themselves are willing to assume responsibility for the actual spraying of the San José scale-infested trees.

It is true that we might have taken up work in one county, but this would not have been just to the other counties. If we had had the funds we would have been very glad to station a man in each of the infested areas to carry on a well-organized campaign, but since your entomologist does not feel like asking any one to work without salary in this scale work we have to await the appropriation of larger funds before the effective campaign begun two years ago can be resumed.

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SUMMARY.

1. *Nursery Inspection.*—This year 51 nurseries, with area of 2670 acres, and 7 greenhouses were inspected and certificated.

2. *Federal Inspection.*—This year 46 foreign shipments from Germany, Holland, Belgium, and France were inspected at points of destination. In addition, all shipments coming from gypsy and brown-tail moth quarantined areas in this country were carefully inspected.

3. *Orchard Culture and Management.*—Experimental orchard work.

Peach-growing areas of the state were inspected and found to be free from Peach Rosette and Yellows. This survey resulted in the removal of California's quarantine against Kansas peach stock.

Conferences were held at a number of the principal orchard centers.

4. *San José Scale.*—This year owing to lack of funds detailed surveys were not made and actual spraying was not done by the department. All of the areas that have been reported infested since this line of work was taken up were inspected and results checked as follows:

The San José scale exists in Wyandotte, Crawford, Montgomery, Sedgwick, and Shawnee counties. It is also found in Labette, Pawnee, and Ford but is here pretty well under control. It has been found in but is believed to be eradicated from Douglas, Reno, Rice, Pratt, and Wilson counties.

REPORT OF THE OFFICIAL ENTOMOLOGIST.

By Prof. Geo. A. Dean.

Mr. President and Gentlemen of the Kansas State Horticultural Society: During the year just past entomological work has been conducted along each of the four lines: (1) The regular inspection and certification of all nurseries growing stock in the northern half of Kansas; (2) careful examination of all nursery stock shipped into Kansas from abroad; (3) location and suppression of the San José scale; (4) orchard demonstration work.

NURSERY INSPECTION.

All nurseries were subjected to a searching examination and were found to be entirely free from San José scale and seriously injurious plant diseases. In several nurseries the apple seedling stock had suffered considerably from the attack of the termite or white ant. This insect was present in a larger territory than it was one year ago. The protection of nursery stock from infestation by the termites is an exceedingly difficult problem. In fact, no practical method of control can be recommended. Very little is known at present in regard to the habits and life history of this insect, and not until a thorough study is made of its distribution, habits and life history will we be able to suggest practical methods of control. Your entomologist is glad to state that the department of entomology of the Kansas State Experiment Station has already started an investigation which, it is hoped, will lead to a successful method of controlling the termite.

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INSPECTION OF IMPORTED NURSERY STOCK.

The Federal Horticultural Board, Washington, D. C., has continued to furnish the entomologist notice of all shipments of foreign nursery stock into Kansas, and as in the past all stock consigned to the northern half of Kansas was given a thorough inspection before it was offered for sale or distribution.

Inasmuch as the inspection of the imported stock failed to reveal a single seriously injurious insect, it goes to show that more careful and thorough inspections are made by the inspectors of the countries in which the stock is grown. We do not have to go back very many years to when the inspection abroad was a mere farce, evidenced by the fact that stock was arriving in this state infested with the larvæ of the brown-tail moth. Your entomologist repeats the statement made one year ago, when he said that with the protection of the federal plant quarantine act, the introduction of the brown-tail moth, gypsy moth, and other seriously injurious insects will be reduced to a minimum, and that with the careful discharge of the duties pertaining to the office of the state entomologist, together with the proper coöperation of our growers and dealers of nursery stock, these pests should never gain a foothold in this state. Understand, the federal horticultural law does not make it obligatory upon the state entomologist to inspect this stock. The responsibility for the inspection of imported stock, after it arrives, is left entirely with the state, and if the state does not make provision for the inspection the nursery stock must necessarily go unexamined. However, the federal law does make it obligatory upon the federal horticultural board to send a notice to the duly authorized inspector or other officers of the state, territory, or district, to which the nursery stock is to be shipped. With each notice the chairman of the federal horticultural board sends two blank reports to be filled out by the inspector, one of which is to be sent to the chairman of the horticultural board, and the other retained for the files in the office of the state entomologist. This state has not only made provisions for the inspection of this imported stock, but it also makes it unlawful for the consignee to open any box, bale, crate, or package of imported nursery stock shipped into the state of Kansas before it has been inspected by one of the duly authorized inspectors of the state. Furthermore, it is the duty of the consignee to notify the state entomologist of his district of the arrival of this stock, who shall without delay send an authorized inspector to open all such stock and make careful examination of the same.

The return of the report on the blank furnished by the federal horticultural board, giving the result of the inspection, is not required by law, but it is a courtesy which every state inspector should extend to the federal Department of Agriculture.

SAN JOSÉ SCALE.

During the summer of 1912 a property-to-property inspection was made of all the infested districts, with the exception of that part of the Kansas City district lying within the city limits. This inspection covered not only the territory known to be infested, but also extended in all directions from the infested district, in order to ascertain for a certainty that

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there was no scale beyond the limits of the infestation. During the winter and spring following the inspection a general "follow-up" plan was pursued. As soon as the leaves were off of the trees and the bark was sufficiently hardened to permit of spraying, two of the state spraying outfits began work at Holton, under the direction of Mr. W. E. Watkins, while work was begun with the third at Elwood, under the direction of Mr. J. H. Merrill. All of the infestations in Holton and Elwood were treated, either by spraying or cutting out the trees.

After completing the work at Holton the two outfits were sent to Kansas City, and work begun there under the direction of Mr. W. E. Watkins. This work was continued as long as possible into the spring. During this time most of the infestations in the country were treated. Arrangements were made for spraying at Lindsborg, and some spraying was done, but weather conditions were so unfavorable that not much could be accomplished. At Wathena we, personally, did no spraying, as the fruit growers there attended to their own work.

During the past summer a property-to-property reinspection was made of the Lindsborg, Marquette, and Webber infestations, and a general inspection was made of the Holton, Wathena, Elwood, and Kansas City infestations. These inspections, which have just been finished, show that the scale has not spread, and that it has been greatly reduced. This is especially true in Jackson county. The orchard demonstration work which was started three years ago in Doniphan county, and which aroused a healthy interest in insect control, has not only brought the scale and other insects under control, but has also induced the fruit growers to attend to their own spraying. The fruit growers of Wathena, who depend so largely upon fruit as a source of income, no longer fear the San José scale, as they now understand how to control it.

Within the city limits of Lindsborg there are so many small infestations that it would not pay each individual to own a spraying outfit. To take care of the work here we have secured for Mr. C. F. Heart, a resident of Lindsborg, a spraying outfit and spraying material with which to do the work. Mr. Heart is to attend to the spraying for scale, assisted by us whenever necessary. In this way the people of that city will get their work done, and done well, as it will be done by a local man who will have pride in his work. We are convinced, as was stated in my report of one year ago, that "the all-important and the constructive movement against scale must be made along the line of arousing interest in fruit growing as a profitable business, through public education in methods of selection of soils and varieties, cultivation, pruning, frost protection, and spraying." We are further convinced that, with the means now at our disposal, it is absolutely impossible to fully enforce the law, but that it is possible to pursue an educational policy, leaving the greater part of the actual work of treating infestations to the owners. As the law now reads, both the careful and the careless owners are under the same conditions, but if we adopt the educational policy, then the careful man may save his orchard, while that of the careless man will succumb to the attack of the scale and soon become what it ought to be, a thing of the past. New infestations are bound to occur from time to time, and the problem of successfully handling the situation will of necessity turn from enforcement to enlightenment.

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ORCHARD DEMONSTRATION WORK.

While the department of entomology has not continued its orchard demonstration spraying as heretofore, in so many widely separated orchards, it has, however, continued to direct and advise the work in many orchards. This work has not only aroused interest, but also has succeeded in getting a large number of orchardists to spray, prune, and cultivate their orchards properly. For instance, in the spring of 1913, in Doniphan county, where the College has been carrying on orchard demonstration work, over thirty power sprayers were purchased. Several more orchardists are planning to purchase spraying outfits and in the future to take care of their orchards.

SPRAYING SCHEDULE.

Mr. D. E. Lewis, assistant horticulturist in charge of the spraying work, and Dr. J. H. Merrill, assistant entomologist in charge of fruit insect control and orchard demonstration work, have arrived at the following spraying schedule, and recommend it as a good schedule of treatment for an apple orchard.*

"Spraying should be carried on both during the dormant period, and the growing season, when an orchard is infested with all the important insect pests and plant diseases.

"The dormant spray is applied after the foliage has dropped in the fall, during open weather in the winter, and before the buds open in the spring. It is composed of the commercial lime-sulphur solution, the homemade lime-sulphur, or miscible oil.

"This treatment is designed to control the San José scale, and to a certain extent the plant lice which affect the orchard and are present in the egg stage at the time of application. The dilution of these materials should be made according to directions on the container.

"The sprays recommended to be used during the growing seasons are:

"1. *Cluster-cup.*—This spray is composed of one and one-half gallons of commercial lime-sulphur and two pounds of arsenate of lead to every fifty gallons of water. It is applied in the interval between the opening of the cluster buds and the opening of the blossoms. In our experiments it has prevented a very large percentage of the normal curculio damage. It is also very valuable in controlling apple scab.

"2. *Blossom-fall.*—This spray has the same composition as No. 1. It should be applied after the petals have fallen from half to two-thirds of the blooms and before the calices close. This spray controls a large percentage of the first brood of codling moth and aids in the control of curculio.

"3. *Three-weeks spray.*—The composition of this spray should be the same as for Nos. 1 and 2, or, if apple blotch is present, Bordeaux 3-4-50 should be substituted for the lime-sulphur. If the weather is damp and threatening at the time when this spray should be put on it will be safer to use the lime-sulphur, and then, as soon as the weather permits, a

* This schedule omits the "ten-days-after-blossom-fall" spray as recommended heretofore. It adds a "five-weeks" spray, if blotch is present in the orchard, and a "third-brood-codling-moth" spray to prevent damage from this brood. After careful experiments, corroborated by practical work in the orchard, we are convinced that this is a better schedule than recommended in my report one year ago.

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spray with Bordeaux should be put on. This also aids in controlling curculio and codling moth.

"4. *Five-weeks spray.*—If blotch is present in the orchard another spraying with Bordeaux should be put on at this time in order to have good control of it.

"5. *Ten-weeks spray.*—This spray is applied about ten weeks after blossom-fall. It is composed of two pounds of arsenate of lead, with the addition of Bordeaux if blotch is present or if bitter rot is expected. This spray is valuable in controlling the second brood of codling moth.

"6. *Third-brood spray.*—Where there is damage from a third brood of codling moth another spray of two pounds of arsenate of lead to fifty gallons of water should be used just as the fruit starts to ripen.

"In ordinary seasons and under ordinary conditions sprays 1, 2, 3 and 5 will be sufficient."

FACTORS INFLUENCING POTATO YIELDS.

By D. E. Lewis, Manhattan.

No crop is of more general interest to the people of the state than is the Irish potato. It is grown commercially in large areas in the more favorable sections, and for home use by both the general farmer and the residents of towns. It is one of the staple food products the world over, and consequently always in demand. Very seldom has the supply exceeded the demand, and then only for a short period. Even at such a time the best potatoes have brought good prices when business principles have been applied to marketing.

The average yield per acre for the entire state is very much below the possibilities for this section, and may by proper methods of culture be considerably increased. The purpose of this discussion is to consider the various important factors influencing the yield, giving especial attention to diseases, since they are not generally well understood.

The results here discussed have been obtained during the past three years, chiefly, and are included in a bulletin on potato culture, which is now in the hands of the state printer and will soon be ready for general distribution.

SOIL.

The soil which has proven to be best adapted to the potato is a deep, rather light loam, high in potash and phosphoric acid and, while not deplete, not high in nitrogen. Fortunately, considerable areas of the bottom lands of the state are somewhat of this nature, and by careful handling may be maintained in this condition. It is not to be understood that potatoes can not be successfully grown on other soils, for by careful handling this crop will produce well on a very wide variety of soils, and is adapted to the uplands as well as the bottom ground.

Very much depends upon the method of preparing the seed bed, and much also upon the kind of crop preceding the potato. Fall plowing has, almost without exception, given better results than spring plowing. The changes due to the action of frost are very important in liberating plant food, the physical condition of the soil is greatly benefited, and the soil is

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in condition to absorb a maximum amount of moisture, when stirred deeply in the early fall and allowed to lay rough during the winter. If the soil is heavy it will probably be benefited by a second plowing in the spring, but frequently the disk and harrow are all that are necessary to prepare the ground for the planter. Another point in favor of fall plowing is that the ground is more quickly prepared for the seed, and an earlier crop results, which experience has shown usually gives better yields.

The following tables indicate the value of various times of plowing in a few of the fields under observation during 1911 and 1912:

Field A.—Plowed July	.....	Yield, 161 bushels.
Plowed March	.....	Yield, 143 bushels.
Field B.—Plowed July-March	.....	Yield, 225 bushels.
Plowed July	.....	Yield, 200 bushels.
Plowed March	.....	Yield, 180 bushels.
Field C.—Plowed August-March	.....	Yield, 198 bushels.
Plowed March	.....	Yield, 113 bushels.
Field D.—Plowed July-March	.....	Yield, 339 bushels.
Plowed March	.....	Yield, 258 bushels.
Plowed September-March	.....	Yield, 287 bushels.

A proper rotation is also of great importance in securing good yields. It is desirable to precede potatoes with a crop demanding good tillage and one that will allow early fall plowing. In addition to these requirements, the previous crop should not be one which would cause an excessive drain on the soil moisture, especially during the latter part of the summer and fall. It is partly for this reason, and partly because of an excess amount of nitrogen made available in the soil, that old alfalfa fields do not usually yield as heavy the first year after breaking up as during the next two or three years. The yield from such a field is usually high when crops demanding a large amount of nitrogen are grown, but in the case of the potato, the tops are likely to grow too large at the expense of the tubers.

Although 1911 was one of the most unfavorable years for the production of potatoes since the establishment of the experiment stations, still the following rotations indicate a relative value of the crops used.

Field E.—Corn 1909; sweet potatoes 1910; produced 108 bushels of potatoes in 1911.

Field F.—Corn 1909; onions 1910; produced 98 bushels of potatoes in 1911.

Field G.—Corn 1909; potatoes 1910; produced 65 bushels potatoes in 1911.

Field H.—Potatoes 1909 and 1910; produced 60 bushels potatoes in 1911.

Field I.—Alfalfa for years previous; produced 55 bushels potatoes in 1911.

It is not to be inferred that alfalfa should have no place in a rotation including potatoes, but rather that some crop such as corn should immediately follow the breaking up of the alfalfa and be followed in turn by potatoes for perhaps two years.

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FERTILIZERS AND MANURE.

Barnyard manure is without question the best fertilizer to use in building up and retaining fertility in a soil. When a soil shows a lack of either potash or phosphoric acid, however, these may well be added by applying commercial fertilizers. When these fertilizers are to be applied they may be added at the time the potatoes are planted, but if barnyard manure is to be used it should be applied a year before the potatoes are grown. This is indicated by the following table:

	Manure.	None.
Field J.—Yield 1911	75 bu.	80 bu.
Yield 1912	210 bu.	160 bu.
Field K.—Yield 1911	65 bu.	98 bu.
Yield 1912	225 bu.	175 bu.

Here again too much nitrogen is made available and the best results are not secured until the second year. Other factors of course might be partially held responsible for the above figures, but these results are similar to a considerable amount of data secured during various seasons, and under varied conditions.

SEED.

The seed is an important factor in determining the yield. The same care is not ordinarily used in procuring potato seed from the highest-yielding plants that is given other crops. Many experiments have demonstrated that by selecting seed potatoes from the best hills for several years a great increase in the yield is secured. In a like manner any desirable or undesirable characters in the tuber itself can be controlled by selecting from these best hills only such potatoes for seed as comply with the type chosen. Such work has ordinarily proven too intensive for a grower and he is content to secure seed which is free from disease even though he knows nothing regarding the yield of the field from which they came.

Northern-grown seed has a decided advantage over the seed ordinarily produced in this state. The vines from northern seed resist the diseases and drouth better than those from home-grown seed, and allow the tubers a better chance to develop. This is partly due to the fact that potatoes intended for seed must be dug early when grown under Kansas conditions and are almost sure to sprout. Such seed has less vigor to impart to the vine than has that which matures later as the northern seed does.

In the following table the advantage of northern-grown seed over the home-grown under similar conditions is indicated.

Variety.	Home grown.	Northern grown.
Early Ohio	224 bu.	249 bu.
Irish Cobbler	171 bu.	215 bu.
Acme	214 bu.	225 bu.

During a favorable season potatoes may be planted late for seed and the crop resulting from the use of this seed compares favorably with that secured by the use of northern-grown seed. Some growers have found mulching or irrigation profitable when used during later summer to secure strong seed. Such efforts may be attended with marked success if hill selection and individual tuber selection is practiced at the same time.

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POTATO DISEASES.

There has always been a tendency among farmers to account for any light crop yield by charging the weather, soil, or any other of the known common possibilities with the shortage. Very frequently one or possibly all of these factors are influential in the final results, but very frequently also the crop would be able to survive these unfavorable conditions and produce a good yield in spite of them if it were not for being weakened by disease. Plant diseases are demanding excessive toll from the general farmer, the trucker, and the fruit grower. During the year 1906 Benton county, Arkansas, alone suffered a loss of $950,000 from a single disease, the apple blotch. Consider what this would mean if allowed to ravage the entire apple producing sections of the United States. The bitter rot of apples has caused a total loss of more than $10,000,000 during a single season which was favorable for its development. A field of oats may promise well, but the yield be reduced one-third or one-half, in a very short time, by the rust. The famine in Ireland in 1845 was caused by a disease, the late blight of potatoes, which practically destroyed the great food crop of that country. So we might consider every crop grown, for none is entirely exempt from disease in some of its many forms.

The common diseases are caused by microscopic plants which, not being able to manufacture food from the usual sources, are forced to live upon the higher plants and obtain the prepared food from their host. This robbery causes various conditions in the plant attacked. It may be apparent as dead areas upon the woody growth, thus causing a canker. In other cases sections of the fruit may be killed and such diseases as scab, blotch, bitter rot, etc., are the result. The leaves may be partially or wholly destroyed, thus greatly weakening or perhaps killing the host outright. In any event, we usually see the effect, not the cause of the trouble, and this condition has been an important factor in delaying the successful control of diseases in general. It is not until we have determined the cause and discovered the methods by which it may be checked or prevented that diseases can be controlled.

The fungous plant differs chiefly from the higher plant in being more simple in structure. It has parts which correspond closely to the parts of the host. By means of slender threadlike parts which grow into the cells of the host, it gathers its food. It propagates and spreads from plant to plant by means of spores which for the purpose of this discussion may be likened to seeds. Some of these spores have the property of germinating as soon as mature, while others are able to live from one season to another, surviving the many unfavorable conditions of heat, cold, drying, etc. Either kind germinates and produces a plant similar to the parent, and it is of great interest and importance that each of these fungous plants demands a particular kind of host upon which to grow. Thus the disease-producing plants of the potato are not able to live upon corn, wheat, alfalfa, etc. This fact offers one of the most important methods of control, namely, crop rotation. By following potatoes with cereals the spores, not being able ordinarily to live more than two or three seasons, perish and the soil is freed of that particular disease.

Another important method of preventing plant diseases which attack the aërial part of plants is by spraying some chemical upon the crop

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which will kill the spores either before or after they germinate. It must be remembered, however, that this method prevents and does not cure disease, and since the presence of the spore can not be detected with the naked eye, it is necessary to follow a definite spray schedule which is based upon a study of the life history of the fungus, and which is so planned that the spray is applied just before the spores begin germinating. No amount of spray will destroy a fungus, with the exception of the mildews, after it has entered the plant, unless it does so by destroying the host plant itself. As an example of the necessity of following a spray schedule carefully, consider one of the most destructive apple diseases of the state, the apple blotch. The spores of this disease are disseminated during the latter part of the third week and during the fourth week after the blooming period in greatest abundance. The disease itself does not show upon the fruit until several weeks later, but no amount of spray applied at this time will affect the disease then within the tissue of the fruit. The spray material must be applied before the mycelium enters the plant, to be effective.

DRY ROT.

The disease known as dry rot is caused by the fungus *Fusarium oxysporum*, and has become prevalent throughout the entire state. It attacks both the vine and the tuber, being first noticed in the poor stand that follows the planting of infected tubers. Plants which survive this stage are very frequently killed about the time tubers are beginning to set, or a little later. The tips of the leaves begin to brown and curl, the entire plant droops and wilts, and frequently breaks over near the ground. The general effect is of premature ripening and a material shortening of the crop. In the tuber the fungus causes brown spots or a definite brown ring shortly below the peel, and is easily observed by removing the stem end to a depth of one-fourth inch or more. No tubers showing this condition should be used for seed. The affected potatoes develop the common dry rot in storage, unless held at a temperature below 40° F.

METHOD OF CONTROL.

The disease may be controlled by planting seed free from the disease in soil which is free from the spores of the fungus. Clean seed may be selected by removing the stem end of each potato as the first operation in cutting, and rejecting any which shows the brown discoloration described above. Soil free from the spores of this fungus can only be insured by practicing rotation, and a rotation should be planned which would allow two or, better, three or more years between the two successive years in potatoes.

Potatoes known to be affected should not be stored, but should be dug early and sold immediately, as they possess their maximum value at this time and become more and more worthless with the age and growth of the fungus in the tuber.

EARLY BLIGHT.

The fungus *Macrosporium solani* causes a spotting and blighting of the leaves of the potato during the fore part of the season. Its injury may become extremely severe during a period of damp, warm weather, or may be almost entirely ignored if dry weather is prevalent at this time.

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The leaf injury can not well be confused with other leaf spots, since the early blight spots are marked with concentric rings, usually somewhat irregular in form. The injury is confined almost entirely to the leaves in its early stages, but may penetrate the stem or even the tubers if allowed to grow unchecked.

METHODS OF CONTROL.

Bordeaux mixture applied at intervals of about seven to ten days during the fore part of the season has proven entirely effective. Spraying should begin when the plants are about six inches high, and be repeated at intervals of about ten days.

POTATO SCAB.

Scabby spots upon the surface of the potato tuber may be caused by a number of factors, but those caused by *Oospora scabies*, the fungus causing the true scab, is commonly known to all growers of the state. The fungus lives over winter in the soil, and if potatoes follow potatoes year after year it will be found impossible to secure clean tubers, even by the use of treated seed. If the tuber becomes affected when small, it frequently becomes so unsightly as to be unsalable, but when the scab spot appears after the potato is well developed it is of much less importance.

METHODS OF CONTROL.

Practice crop rotation.

Potatoes affected with scab, or those which have been stored or shipped with scabby tubers, should be treated before planting, in one of the following ways: To thirty gallons of water add one pint of 40 per cent formaldehyde, and soak the potatoes in this solution for two hours before cutting. After removing from the solution they should be dried, cut and planted in the ordinary way, being careful not to place the treated seed in containers which have held untreated potatoes. A good plan is to place the tubers in coarse burlap sacks and submerge the sack completely in the solution. The sacks may then be used for the treated tubers.

Corrosive sublimate may be used instead of formaldehyde for this work, at the rate of one part of corrosive sublimate to one thousand parts of water. This material is a deadly poison, and must be handled with care.

LATE BLIGHT.

Although little known to the growers of the state, the late blight, caused by the fungus *Phytophthora infestans*, may become serious under favorable weather conditions. The disease makes its appearance as a mildew upon the leaf, changing to a brown color and having an offensive odor. From the leaf the fungus spreads to the stem and tuber. Its presence in the stem causes a dark discoloration, and in the tuber it causes a dry rotting, at first noticed near the surface but finally extending throughout the potato.

METHODS OF CONTROL.

Crop rotation, selection of clean seed and spraying are entirely effective as control measures in this state. The disease is usually absent during dry, hot seasons, becoming serious only during seasons of cool, moist weather.

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TIP-BURN.

Not uncommonly disease is charged with the death of plants which really have been killed by other causes. When hot, bright weather follows a period of rain, the injury commonly known as tip-burn is almost sure to appear. The potato leaves have become gorged with water and are tender, and easily killed by hot, bright sunshine. Keeping the plants in the best possible growing condition by frequent cultivation and spraying has been found the only practical method of preventing such injury.

A similar injury is frequently caused by Paris green when applied in water without the addition of lime. Two or more pounds of lime should be added to each fifty gallons of water containing one-half pound of Paris green.

SPRAYING MATERIALS.

The best materials for use in potato spraying are copper sulphate and lime combined, in water, to make Bordeaux mixture for the control of fungous diseases, and arsenate of lead or Paris green as poisons to control insects.

BORDEAUX MIXTURE (4-4-50).

Dissolve 4 pounds copper sulphate and add it to 25 gallons of water. Slake 4 pounds good stone lime, as for mortar, and add to 25 gallons of water. Pour, in any convenient way, the dilute copper sulphate and dilute lime water together in equal amounts. Do not pour one entire amount into the other if it can be prevented, but let the two solutions mix as they are poured into the spray tank in equal amounts. About 50 gallons are required to spray an acre.

SPRAY MACHINERY.

Gasoline power sprayers have the advantage of giving a higher, more constant pressure than hand or traction machines, but good work can be done with the latter outfits if nozzles adapted to lower pressure are used. Several good types of potato sprayers are found on the market, and the following points should be especially considered in choosing a machine: Sufficient pumping capacity to afford good pressure; large air chamber; good agitator; easily adjustable nozzle carriers; good relief valve to maintain constant pressure; strong, durable, easily accessible parts. The tank should hold at least fifty gallons, and be well made, of good material. The wheels should be high; a tongue should ordinarily be provided, and the wheels so spaced that two horses may be used, as the draft is too great for one horse. Such a machine will properly spray from fifteen to twenty-five acres a day, provided that water may be obtained easily.

A machine may easily be constructed at home if a good pump and engine are at hand. Barrels placed in an ordinary wagon take the place of a tank and the suction hose is changed from one to the other as each is exhausted. The discharge hose from the pump is connected to a three-fourths- or one-inch gas pipe, long enough to cover from three to five rows. This gas pipe is suspended from the rear of the wagon bed and one-half-inch pipes are dropped from it at such intervals that they are carried immediately over the rows to be sprayed. Nozzles placed

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upon these pipes complete the outfit. Care must be taken in operating a sprayer of this kind that a good hand agitator is placed in the barrel from which the liquid is being drawn, and kept moving almost constantly. Such an outfit, especially when five or more rows are sprayed at a time, is not well adapted to uneven ground or to rows of unequal widths. A barrel pump or large hand pump may take the place of engine and pump in an outfit of this kind. It has been stated by growers that a wagon containing so much weight packed the ground between the rows, and in this way caused some injury to the vines.

SOME THINGS A FRUIT GROWER NEEDS.

By F. W. Dixon, Holton.

It might be entirely proper to change this title to Many Things a Fruit Grower Needs to Know. The first thing a prospective fruit grower must learn is that he does not know anything. The beginner is prone to think that after some study of the situation he knows something about fruit growing, and that all he needs to do is to plant fruit of any and all kinds on any and all kinds of soil; then fortune will smile on him, and only a short time will be required to transport him to that class of worthy individuals who have arrived at that station where they do not have to work. He believes that a steady income of large proportions has arrived to keep him comfortable until the end of his days. What a short time it will take to disillusion him! I am safe in saying that the lack of knowledge of soil and location has caused more losses in fruit growing than any other one thing. By location I mean nearness to shipping station or market. Of course we take it for granted that any one who tries to grow fruit likes the game, and I want to say right here that if you don't like the game please stay out. Go to railroading, run for congress, or become a lawyer, or choose some other occupation than fruit growing.

Many times in the course of a season I am asked advice as to planting an apple orchard. In most cases I have one reply. I advise a would-be orchardist to buy trees, no difference what the variety, and be sure to pay the nurseryman, for the nurseryman needs the money. And as a general thing the individual will make more money, and save himself lots of trouble, by dumping the trees over the backyard fence. Not many men have the perseverence to stay with the game until they succeed. A fruit grower needs to know that eternal vigilance is the price of success.

I can enumerate many things that the fruit grower needs to know.

First, he needs to know that the soil that he contemplates planting his fruit orchard on must be adapted to that particular business. How many do know? I am safe in saying that not ten per cent of the orchards of Kansas are planted on soil that is adapted to orcharding, or to any other kind of fruit growing. There are many farms that really have no favorable soil for a fruit orchard, while there are farms that have unusually favorable soil, yet most individuals plant on the most unfavorable place on the farm, and then wonder why they do not have paying crops. It requires years of study and actual experience in the field for men to know just what soil and location will prove satisfactory. You must know,

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for one thing, that you can not grow good fruit of any kind on poor soil. Another phase of the question that the fruit grower must know is the selection of varieties. In the early days in Kansas almost all varieties were planted, and not many were profitable to the growers.

I believe that no section of the earth has a better prospect of becoming a notable apple-growing section than northeastern Kansas. There is no doubt that we are in the center of the Jonathan district, and that we can produce better Jonathans than any place on the earth. The Winesap is all right, but requires a better soil. In addition to these two varieties, I would plant more Winesap and Jonathan. And do you know that it is one thing to plant trees, and quite another to care for them? Some of the newer varieties, such as Stayman Winesap and Delicious, might do to plant in a small way, but I do not advise planting largely of any untried fruit. It is only of very late years that we have come to a realization of the fact that we can not grow good fruit in a haphazard manner. Fruit growing is really a job for the man who wants to know, who cares, who will stay with the business until he succeeds.

Next to soil, location and selection of varieties is spraying. Spraying spells success, so the fruit grower must spray, and spray thoroughly, every time it is needed. Had I the authority, I would not allow a wormy or diseased apple to be placed on the market for any other use than cider. Cultivation, pruning, etc., are problems for each individual to work out to suit himself.

Another thing that the fruit grower needs to know is that there is no profit in growing inferior fruit. Most of them have found it out, and I want to impress that fact, that the grower's profit will be "nil" if he does not grow the very best quality of fruit. After all the above enumerations have been complied with, and many other little things that I have mentioned, the orchardist who produces fruit of excellent quality will have no trouble selling at a profit. A grower with first-class fruit will not have to hustle to find a market.

To bring about the conditions enumerated above, the fruit grower needs to be an optimist; he needs to be thoroughly interested in his work; he needs to be on the job at all times, and he needs to know it takes time to bring about success. It is not a business which brings vast wealth in a short time, or a long time either for that matter, but there is much satisfaction in being able to bring about results that are a benefit to mankind. After all, is there any real satisfaction to a speculator who through a turn in the market has accumulated a large sum of money? Has not the man who produces something for the benefit of mankind much more to be satisfied with in his life's work than the man who has accumulated wealth for selfish purposes?

And since prohibition has come to stay, it means a better market for our fruit, at better prices. When prohibition becomes nation-wide, and the larger per cent of the two billion dollars per year now spent for liquors is used to purchase fruit, not only will the fruit grower prosper, but all mankind.

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SECOND DAY—Afternoon Session.

The following gentlemen were elected trustees for the ensuing two years:

First district, W. R. Martin, Wathena.
Third district, F. L. Kenoyer, Independence.
Fifth district, Albert Dickens, Manhattan.
Seventh district, E. E. Yaggy, Hutchinson.

THE COMMERCIAL ORCHARD.

By J. L. PELHAM, Hutchinson.

While I have been coming to your meetings off and on for several years, this is the first time I have ever stood before you. I was asked to read a paper, and you will find I am a poor speaker, but in my rough way I will give a miscellaneous talk as it comes to me. I will try to talk the best I can on the commercial orchard, and if you have faults to find somebody will have to be censured, and I guess that will be the one who asked me to talk. Of course, I don't expect every one to agree with me. We have had some good papers here, and my subject has been touched on more or less. In this subject I might go into half a dozen different phases and talk all afternoon and still not cover very much ground.

I am young in this work, having been engaged in it about fourteen or fifteen years, and especially in apples. I think more of the apple than any fruit that is grown, and I have made more of a study of the apple and its diseases and insects. I am just now commencing to find out that there is very little that I know about it. I am in hopes, if I stay with it another fifteen years, I will know more than I do now.

Just where we can make our distinction between a commercial and a home orchard is hard to decide. I claim that any orchard that will supply more than is needed for the family use may be classed as a commercial orchard. We are having lots of knocks against the large commercial orchard, and there is a lot of room for them. So what I say against the large commercial orchard, or in favor of it, is as I see it after several years' work with several hundred acres in apples. We may say that the commercial orchards may be divided into three divisions—the commercial orchards of the past, of the present, and of the future as we expect to see them. I believe all honor and credit is due our forefathers for planting the early orchards, but as you admit and have been admitting to-day, we see the mistakes they have made, and I feel that we are suffering from those mistakes to-day. Some of these orchards were planted thirty or forty years ago. We find orchards all over the state as old as forty years. I know of one that old, and we find in those orchards the varieties that were the planters' favorites. Some of them are still doing good service. I know of one tree, a late Strawberry, from

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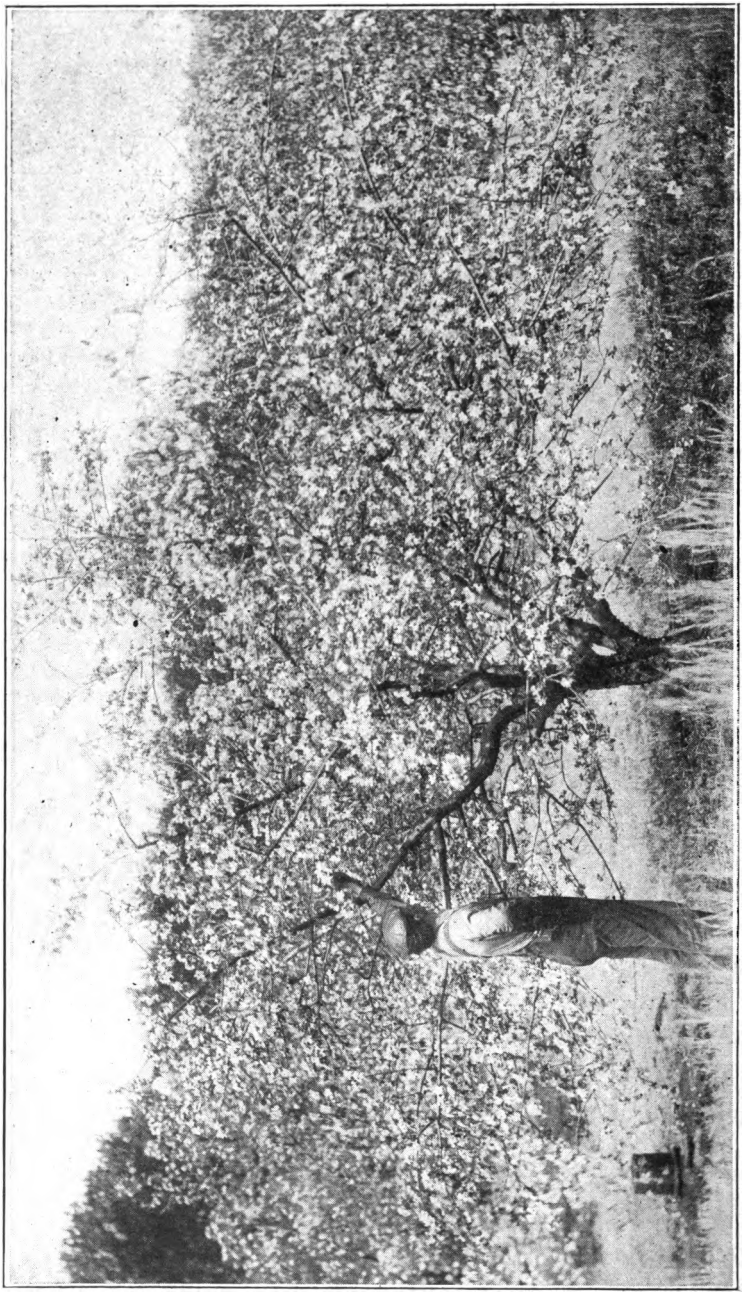

BLOSSOMS IN THE UNDERWOOD ORCHARD, HUTCHINSON.

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which I have picked sixty bushels. That tree has certainly paid in one season. It has certainly paid its way. I know of other trees right adjoining it that, to my knowledge, have never given one bushel of apples in the several years that I have been acquainted with the orchard. We look into those orchards and find space after space where the trees are missing, due, perhaps, to the selection of varieties not adapted to those conditions, or else a weak variety. Others are still standing as handsome trees, but have never produced an apple, and the owners never had the nerve to cut them down. In some ways they can not be blamed; in others they can be.

A few years ago—seventeen or eighteen—we took a big step forward in planting commercial orchards; got a little overenthusiastic about planting large orchards, and I think we were suffering from lack of business judgment in planting those orchards. Men who perhaps had other business took a little of their surplus and joined together and selected one of their number to manage the orchard, without any advice from men who knew the conditions of the territory where those orchards were planted. We had a repetition of the old orchards, in the selection of varieties not adapted for commercial purposes and of trees from poor stock. I can not get away from it, with my few years' experience, that our nurserymen and the fruit grower are equally responsible for the present condition of the large commercial orchards and the home orchard itself. It is true that we might take the best animal or plant we have and put it in unfavorable conditions and it will never amount to anything. At the same time I do not believe we can take the scrub and give it the best environments and make the best plant out of it. We can improve it, but we can not make it the best; and so I think we are suffering to some extent from poor stock, yet there is a lot of ground for difference of opinion about selecting scions and buds for our stock. I know to-day of trees that to my knowledge have never had a blossom on and are eighteen or twenty years old. It looks to me as though there is a breeding back, or a tendency to get back to the wild stage, that has caused those apple trees never to produce, and so we are suffering from that result. Those trees, of course, ought to be pulled out and replaced with others; and as soon as I say "replaced" I raise another question on which a great many people will differ. I have had it told to me that we did n't dare to go into the old orchard and plant where the old tree was pulled out. Perhaps there might be some disease there. Of course I will agree to that to a certain extent, yet I have been successful in replanting old orchards, and I believe any one can be successful if they will take proper precautions. I don't believe in going in and pulling out one of these worthless trees and planting that same season in that same hole. I believe in opening up the hole and letting the elements take their course, and, I might say, sterilize that old ground. I have seen a few trees come into bearing that I myself have replanted.

I do not aim to go into the question of varieties, because there is such a great difference of opinion there. It may be taken up, but what I want to get after is this. To-day we have with us the mistakes that have been made. The large commercial orchards are considered failures, but is it

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necessary that they should be failures? I don't think so. I feel as though it is due to the lack of business management that an orchard of three, four, five or seven hundred acres is a failure. Where there are several stockholders they put an orchard out, and will not consider the orchard business as any other business. They do not seem inclined to place large commercial orchards on the same basis as other business enterprises, in figuring running capital necessary. I believe though, if they would do that, the Middle West would outclass any of the western country. I believe eastern Kansas, western Missouri and northern Arkansas can outclass the West in every respect. I believe, though, we will have to admit that because of the lack of planting large commercial orchards on the right financial basis we are practically at the end of large commercial orchards.

I believe that our future is going to lie with the small orchard, of anywhere from five, ten, twenty to one hundred acres, due to the fact, as mentioned yesterday afternoon, that we are educating our young people, and the farmers as a whole, to take better individual care of their trees than has been done in the past. And so I believe it is coming to pass that we can take care of the pests and insects we have to-day that we did n't have fifteen or twenty years ago. We have to fight now for every barrel of apples that we harvest. I have been fighting those conditions ever since I have been in the business. I took in the first spray pump that went into the southern part of Missouri. The people down there said we can not grow apples here and go to all this expense of spraying every fruit tree in our orchards, and the neighbors used to gather and watch me spray those trees. I said, all right. There were several orchards in that neighborhood of twenty or thirty acres. My orchard was twenty acres. I had codling moth, I had bitter rot, too, that we do not have here. I was three years in cleaning up that orchard. The first year there was a renter on the place. I think we got a half bushel of apples. The orchard was then about eight years old. It commenced to increase every year. At the end of the third year we took in about $700 or $800. So after I had had the orchard six years I had the pleasure of having my neighbors tell me that they had never seen anything to equal it. We must put our orchards on the same business principles as we do any other commercial enterprises that we may enter into.

Another thing against the large orchard is that lack or inability to manage it and give personal attention to individual trees. You take a stockman to-day who has a large herd of cattle, and if he does not have the ability or does n't have his work organized in such shape that he can look after every sick animal in that herd he will soon have a large loss. He will not have as much chance as the man with the small herd. They used to accuse me of sleeping in the orchard. They would say, "If I slept in the orchard, as Pelham does, I could grow apples." I told them I found out that it paid me. I don't believe in that small orchard there was a single tree but what I knew its every characteristic.

With 450 acres of young trees that was impossible. I could know about sections of the orchard, but as far as knowing every individual tree in the orchard, I could n't do that. So there we are. The hired man

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will not take the interest in the orchard that the owner will. While in our small orchards, five or ten acres, if the owner has planted those orchards and has trained up his "child" he will know every tree in the orchard and can treat it. I find this condition in orchards to-day. I believe it is not saying too much to say that at least 20 per cent (and I know of one orchard where it goes as high as 40 per cent) of the trees show themselves going back to the wild stage where they are not profitable. I know of one tree that I have noted for several years, that is highly productive. Every season it has shown itself as standing out above its neighbors. As far as I can see, there is no difference in the soil. Now, is n't it possible that that is a better tree? We consider it a better tree in every way. Is n't it right that we go to that tree if we are propagating? Would n't we wish to have our scions from that tree? I realize that it is deep water in saying whether that is right or whether it is wrong. One orchardist that I know of has been getting his scions, about eighteen years now, from the same nursery row. I don't believe there is a man here to-day but what would rather have his scions come from those trees that have been located and been watched and have been giving better results, than to have scions coming from those nursery rows for eighteen or twenty years which never had an apple on them. I have no individual friends in the nursery business, and I don't say we should have pedigreed stock, same as the live-stock business, but it looks reasonable to me. I believe that if in the orchard we are planting we know that those trees come from good bearing stock, we will have more productive trees. I know there is going to be a tendency to pull them back to the wild state.

On the question of our spraying. I would n't for a minute go into our spraying calendar, because that has been given us in as definite form as can be; but is this the right time to spray? I have had it asked me every year. When shall I spray my trees? Some say, I won't buy a spraying outfit until my trees commence to bear. I think I have seen results from spraying the first year they were put out. The presence of the leaf roller and skeletonizer on the young tree will show in the future. I believe we must get a good start. I expect to spray my trees at least once the first year they are put out. If necessary, I would spray twice, as the insects show up, so as to help the young trees, and I would continue every season to give it a good start and help it make a vigorous and healthy growth. This last season men would phone to me and say, "Pelham, my apples did n't bloom very well this year, shall I spray? If so, when and how many times?" If I knew I would n't have a single apple on my trees I would spray at least once, for the same reason that I would spray young trees, to help them make a good, vigorous start in the early spring. I sometimes feel if we have a tree that has made a strong, vigorous growth in the early part of spring, a little appearance of skeletonizers would be a benefit for the next season. If the tree had been making a good, strong, healthy growth a little check the coming year in season would help the fruit buds.

We have n't heard anything so far on the question of smudging. There is a difference of opinion there, but I believe it is one of the essential things in the commercial orchard of the future that we must protect our-

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selves from different conditions of temperature, as well as spray for insects. Just what the apple tree will stand in the way of frost, I think every one will agree with me that we are learning. This season we had temperatures that went dangerously low. It is merely a matter of insurance with us, and so when the temperature dropped to about 33 degrees I went out and started my fires, and my neighbors did n't do anything. I could n't see any result the first two or three mornings, but later in the season I began to see what I believe was a benefit; I believe that the benefit to those apples showed very clearly. That is, I had less drop. The drop in that part of the orchard was much lighter. While the blossoms were not killed, I believe the tree was benefited. The apples held on till late in the season. I think I received a benefit, and I think it is something we must figure on. I will not take any definite stand on a certain fire pot. That will have to be decided by every grower for himself. I do not think now that the orchard of the future can afford to neglect the heating question.

In regard to pruning. I hardly agree with any of the orchardists about the pruning of the far West. My experience has not told me that you must prune as severely as they do in the West. I believe in a middle ground between what has been done here in the past and what is now being done in the West. I think I saw the results this year of the trees being opened up and giving the sunshine a chance at parts of the trees where they had never been pruned before. I do not believe I ever saw as complete a covering of blossoms as I saw this season. I think it took me about three seasons to bring up conditions to those of this year. They showed up very differently this year from the ordinary pruning. I believe if we have a big red apple we must reach that apple with the sunshine; that the pruning should be sufficient to let the sun shine through all parts of the tree.

In regard to the growing and packing of the commercial apple, we have a big lesson to learn. We have to give it to the West on the question of packing; but we must come to it. Our finest apples can not go to the same market with the apples from the West. That seems to be all a lack of coöperation or knowledge of what should constitute the proper pack or grades of apples. Now that it something I believe ought to come before us and be decided by this organization; something that would compel owners of orchards to adopt a uniform pack; the quality we will have to give to the Middle West on apples. I have had apples on my table from the East, Middle West and extreme West, and I claim that the quality of the apples of the Middle West can not be beat. Of course, they have some apples that are not adapted to our conditions here, but with the commercial varieties I claim they can not equal our Middle West apples. It is my hope that we may see in the near future the Middle West apple in the place it deserves to be. I expect to see it in the small orchard, but I dread to see that day unless we bring about proper coöperation. I can imagine a little farmer here and another there, each one trying to sell his little store, all grades and all ranges of prices. So it would be a detriment if you developed this Middle West as it should be developed, with the small orchards, unless you develop at the same time the proper coöperation in regard to the treatment and care of the orchard, and varieties and grades.

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I believe with proper care and management of an orchard, regardless of the age, that we will always find the apple business profitable business from the time they first commence to bear, but with neglect it is an expense and detriment to us. We have reached the stage, I think, on orchards that are now out, where we should do one of two things. We should either buy a stump puller and pull those trees out or else get a sprayer and spray them.

PRESIDENT TREDWAY: Gentlemen, do you desire to discuss the subject that Mr. Pelham has been talking about?

EDWIN SNYDER: A very able address on the subject of Commercial Orchards. There was one thing the speaker did not place as much stress on as I thought he might, and that was on the matter of varieties. I planted two or three commercial orchards, and I want to say that a man's mistakes are just as profitable to his friends and neighbors as his successes. In one commercial orchard I planted 400 trees; I had forty varieties. The next orchard was 2000 trees, and I made up my mind that I did n't know as much about varieties as I should, so I wrote to Judge Wellhouse, of blessed memory, and told him what I intended to plant, and he wrote me that I was all right, only he thought I had better be careful about planting too many varieties. Now, if planting a commercial orchard, I should plant just two varieties. I should plant Jonathan and York Imperial. I would n't be bothered with a lot of varieties that I did n't know anything about.

A. H. GRIESA: While I do not care to discuss the subject before the meeting, I would like to throw out an idea on what the result would be in grafting from certain trees because they are productive. That is a very erroneous supposition. It is a good foundation to start on, but they forget that trees are grafted on apple seedling roots, and most apple seedlings are not all of uniform vigor or vitality, and that is where the different productiveness in trees comes in. You never hear of variation like that in cherry trees. There is no variation in them, but there is in apples. You never hear it discussed in grapevines, because they are always uniform. You take an acre of Concords. They are alike, except for difference in soil. If he wants trees of uniform vigor, a good way is to get crab apple seed—Hughes' Virginia crab apple or the Transcendent are good—and he will get uniform root and he will get uniformity in productiveness. There won't be any off trees about it. It requires a little more care, a little more work, and don't look quite so good as to breed thoroughbred stock, but it isn't in the scion, it is in the root. Most nurserymen, in digging trees, will throw out a great many trees because they are deficient in root growth. It is simply because the roots used to graft part of them are not as vigorous as others.

PRESIDENT TREDWAY: Gentlemen, that is good advice from an experienced nurseryman.

T. C. GARST: I want to ask a question. I think his talk is just a little in line with the thought that is in my mind. The gentleman made an address on the subject of good stock and poor stock, and the question with me is, how can an uninformed person evade purchasing poor stock for good stock. Now I know that we can go to a tree of our neighbor's, a good healthy tree, and we can get our grafts here, get our buds, and put

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them in good healthy stock, but it is a slow method. But how shall a person that is uninformed evade being imposed upon by those who propagate trees just to sell?

PRESIDENT TREDWAY: Learn who some reliable nurseryman is, and then stick to him.

C. A. BLACKMORE: I think the best thing to do is to burn about 90 per cent of the literature that comes to him, and second, go to the Agricultural College for information. At least 90 per cent of the literature that comes to the average man should be burned.

A. H. GRIESA: I was in the nursery business for a good many years, but I am not now. I have always experimented with new varieties. If I got a good new variety I would try to sell it. Don't you know, it was hard work to try to convince a person so he would buy a certain new variety instead of something that he had on his list. As I have told some, if they had taken my advice and planted out 2000 instead of 200 trees, they would have been independently rich. There are people in the nursery business who are as unreliable as they can be, and who grow their trees from apple seeds; no more Virginia crab apple seedlings than I am; just common apples grown in the nursery. The hardiest and best seedlings obtained will come from the crab apples. Seeds from the original seedling apple orchards of the East are far better than any commercial varieties we are growing now, as far as the average stock is concerned, for grafting.

THE GARDEN.

By O. F. WHITNEY, Topeka.

This garden will have several branches. The question is so large that I have called in assistants, to whom I shall give due credit. The value of a garden is almost beyond estimation. No other acre on the farm is as valuable as the piece of ground devoted to olericulture. The growing of products in this garden of mine is a great economical industry. It goes far towards solving the high cost of living or the cost of high living. The products from this garden pay no transportation tax. From the garden to the kitchen of the farmer is the minimum distance of any transportation. The products of the garden are ideal supplies when fresh, and the surplus may be canned for future use. The vegetable garden seldom fails. If the frost gets the first planting, all that we have to do is to plant again. I shall not go into detail as to kinds, varieties or the time of planting. The catalogues will give full and complete instructions along that line, but we must have some perennials, such as rhubarb, asparagus, winter onions, and certain kinds of small fruit.

No planter, farmer or gardener is so wealthy that he can afford to buy poor seed. Right here let me digress far enough to say this. The government should have plantations, in various localities of adaptability, where pure seed should be raised and furnished to the people at cost. Then, and not till then, will we always get what we call for. We have many good, honest seedsmen, but the seed as a whole is not produced with enough care. From the mustard seed to the corn we need absolute purity.

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That applies to the vegetable garden, but my garden to you contains numerous branches. You must have a small-fruit garden, and I will tell you the reason why. We admit that the apple is the king of fruits, but an apple orchard is not made in a year or two. That is the time it takes to get our small fruit. Every farm garden should have a bed of strawberries, blackberries, raspberries, and gooseberries. All of these are quite sure in the way of bearing luscious fruit.

You will also need some early apples. Few families have enough early apples, and our local market has never been supplied with enough home-grown Red June, Early Transparent or Early Harvest apples. I do not advise planting the peach, fine fruit that it is, because it is not a sure bearer in this locality.

Now here is another garden, and it is also a good one. There is not a quarter section in Kansas which is incapable of producing some kinds of forest trees. A grove is a valuable asset to any farm, and if properly planted and cultivated will pay rent and interest on the investment. Every year it becomes more valuable. Lumber and timber get more scarce every year. Plant acorns, walnuts, hickory nuts, and pecans, and as you go west select the kind of forest trees recommended by our Forestry Commission.

A housewife says: "If the men folk could only know the help and pleasure, to say nothing of the wholesomeness, of the products of the garden the housewife would be greatly relieved from the ever-perplexing problem of what to get for dinner, or what to prepare for the evening meal, that the family may have the very best for their health and comfort.

"The varieties and fruits in their season should be produced and enjoyed by every family in rural life. Begin with asparagus, spinach, lettuce, radishes, beets, and the like, for early vegetables. (You will notice that I have omitted the onion, but those who like may include it.) For the early fruits plant rhubarb, strawberries, gooseberries, cherries, raspberries, blackberries, the Red June and one or two other varieties of apples, all of which are very easily produced. The later varieties should follow through the entire producing season of vegetables and fruits.

"Persons who eat such food should not have the abnormal appetite for harmful confections in the form of candy, gum, chewing tobacco, and the like.

"So let us strengthen the hands of the gardener by demanding and using his health-giving products.

"Let 'Nearer to Nature' for our foodstuffs be our watchword, so that good health and long life may, please God, crown our efforts."

Mr. F. P. Rude says: "The four essentials to a good garden are: First, good soil, plowed in the fall; second, good seed; third, early and continuous planting; fourth, good care and cultivation. If you will follow these rules I will insure you a good garden. It will give better returns than any other land on the farm in proportion to the work of caring for it, and will furnish more varieties of food for the table and health for the family. Why it should be so neglected is hard to understand."

Mr. C. H. Withington, of the Topeka high school, tells us of the garden as applied to the school child: "The efforts of encouraging the school children to beautify their homes by gardening has passed the experi-

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mental stage in our city. Last summer hundreds of our school children had fine gardens in spite of the dry weather. A number of pupils who had gardens last year planted larger ones this year, varying in size from 25 x 50 feet up to a lot or more. From their gardens they sold vegetables, some putting their money on interest, others using theirs to purchase extras. This teaches them thrift, or, in other words, the value of a dollar.

"In our work with the school children and their gardens we find the child with his garden has more respect for the personal rights of others than the one without. This is a fine advancement towards the private care of public property, and hence the development of civic pride.

"The writer thinks that gardening for the school child is the best nature study possible. By gardening he becomes familiar with the different tools and their uses. He learns to respect manual labor instead of resenting it. He also becomes familiar with the soil, which is the foundation for all life. By reading such stories as 'Carl and the Earthworm,' 'King Solomon and the Bee,' 'How the Bee Got Her Sting,' 'Story of a Bean,' the child becomes interested in nature, and will observe for himself.

"He receives training in his mathematics by planting his garden, testing the germination per cent of seeds and counting up his loss and gain. Above everything else, the child becomes familiar with the common vegetables and their mode of growth.

"I will give the following example which occurred in our city last spring: Johnnie, a boy ten years of age, took some radish seeds home from school, and, out of respect for his teacher, planted them in his back yard. He took good care of his plants, and in a short time had some first-class radishes. His mother had him pull some for dinner. After they were cleaned and placed on the table he would not eat one of the radishes which came from his garden. When asked why he would not eat his, his prompt reply was, "Because they came out of the ground and are not good to eat, while the others came from the store.' This boy to-day is one of the most enthused young gardeners in the city."

Mrs. F. P. Rude tells of the flower garden: "The flower garden of to-day is not often a formal one. It is usually planted in the form of a broad border filled with perennials and the spaces between planted with free-blooming annuals and bulbs. But whatever may be the form, it must contain the old-fashioned flowers of our grandmothers' gardens, for they have become the new-fashioned ones of to-day. The pleasures that may be derived from it, and the beauty it will add to the home grounds, can hardly be estimated. Even in our dry climate, many of the perennials do well and repay us for the best soil and care we can give them."

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HORTICULTURE IN KANSAS, PAST, PRESENT AND FUTURE.

By Dr. G. Bohrer, Chase.

In taking a retrospective view of horticulture in Kansas, the writer has had but limited access to published facts concerning this industry aside from what he has been able to glean from traditionary sources and personal observation since his location in the state, and in Rice county, in 1873.

At that time there was not a bearing apple tree of any kind in Rice county; in fact there were but very few bearing trees west of Lyon county. The principal fruit districts were in Atchison, Leavenworth, Douglas, Wyandotte, Wabaunsee and possibly Shawnee counties.

The most noted fruit growers then were, as far as I can call to mind their names, Dr. William Howsley, Dr. Stayman, Fred Wellhouse, Geo. Y. Johnson, George C. Brackett, Captain E. P. Diehl, and William Cutter. Most of these men were at an annual meeting of the State Horticultural Society held in Abilene, Dickinson county, in 1877, and in the month of June, I think. I attended this meeting more for the purpose of ascertaining a list of fruits to start with, and which were adapted to Kansas, than for any other purpose.

I was given the following list of apples: For winter; Ben Davis, Missouri Pippin, White Pippin and Winesap. Fall list; Wagner, Grimes Golden and Maiden Blush. Summer list; Early Harvest, Red June, and Red Astrachan.

Captain Diehl was the only one of the above-named gentlemen who did not speak of my judgment in deciding to grow an orchard in Rice county about as did an Irishman, who, when he saw an animal square himself for a fight with a railroad engine, pronounced his courage splendid, but condemned his judgment. This, of course, was cold comfort to me, after having driven one hundred miles over poorly broken roads and through high water.

Speaking of high water reminds me that when on my way home I had a swollen stream to ford east of McPherson, and not being familiar with the different fords and there being two different places where people crossed, I thought it best to make inquiry of an elderly gentleman, who had crossed a moment or two before I met him. He gave me directions as to where to cross in safety. As I was passing down the stream to the place where I was told to cross I saw two young men putting on their clothing. They called to me and stated that if I would cross where they had a few moments before crossed, I would have much more fun than I would at the ford where I had decided to cross. They had attempted to ford the stream with a farm wagon and team of horses, which resulted in their wagon box being floated off and the hind wheels being uncoupled and left in deep water. They had just succeeded in recovering both their wheels and box.

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All these mishaps I associated with my long drive and the poor encouragement I got from the pioneer fruit growers I had consulted at Abilene. But in face of these discouragements, and coupled with the fact that Kansas was mapped as part of the Great American Desert, I nevertheless planted apple trees until I had set out seven hundred and fifteen, all of which lived and grew rapidly except two White Pippins, which I injured by sowing oats about them. Among these trees was a Missouri Pippin, which in three years after being planted bore two apples, which probably were the first apples grown in Rice county.

Many home seekers visited this orchard in order to see if fruit trees would actually grow away out in the very center of Kansas. Many orchards were set out between that period, the seventies, and the present time, 1913. Much valuable fruit has been grown in nearly all of the territory east of Rice county, but in the meantime, all has not been clear sailing. The school of experience has been constantly going on and it is to be hoped that much valuable information has been gleaned from this source.

Among the early lessons taught were that fungi, codling moth and cankerworms were invading every orchard, with probably no exception, and their ravages were such as to render the industry of fruit growing a failure unless these pests were successfully combated and held in check. Spraying has been the only remedy, up to the present time, that has been anything near satisfactory in its result. The law as it now stands is not sufficiently drastic to cause the remedy named to be universally brought into requisition. Until spraying is made compulsory this discouraging state of affairs will go on, thus giving the state a bad name as a fruit-growing country. A law making it the duty of every county sheriff to see to it that every orchard in his county be sprayed every year in the most approved manner will cause a speedy halt to be brought about.

The above is not the only lesson that the writer has learned, for in perhaps every county of the state the longevity of fruit trees has been shortened on account of a shortage of rainfall. It is but proper to state that the farther west in the state we go, the more apparent this source of shortening of the life of the tree becomes. The horticulturist should take advantage of this fact and avail himself of the means of supplying the necessary amount of moisture. This is done in Colorado, California and other states where there is a lack of rainfall.

Strong evidence in support of the fact that protracted drouth has much to do with shortening the life of trees is often shown by limb and root blight. This evidence has been quite abundant in the writer's orchard, which was set out during the seventies, and can be seen in every orchard west of Shawnee county, especially on elevated ground, where the supply of moisture is always shortest, or at least the shortage shows up first and most prominently.

In further support of this view of the situation, it is only necessary to note the fact that trees on bottom lands, where moisture is more abundant, bear fruit of a higher grade and are longer lived, especially where the ravages of the cankerworm have been held in check by spraying. In this connection it will be well to note the fact that in every section of the state the first two or three crops of fruit are by all odds the most per-

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fectly developed, and especially so in the absence of fungi, codling moth and cankerworms.

At the present time, with all the cases of imperfectly developed fruits, injury and loss of trees before us, it is evident that if the reputation of Kansas is to hold a rank of respectability as a fruit-growing district, steps must be taken in the immediate future to provide effective remedies to hold in check the enumerated hindering causes of injury and loss.

Effective legislation making spraying compulsory has already been referred to, and the matter of supplying a shortage of moisture has also been mentioned, but the method to be adopted in securing it is by far the most difficult problem to solve. Where water is accessible by ditching, the matter can be effectively remedied at probably less expense than by raising water to the surface from the underflow known to exist in some parts of the state. There are, however, few localities where water sufficient to irrigate a few fruit trees can not be found, and in the opinion of the writer, but a limited number of trees should be planted in such sections, for the reason that the fruit obtained from poorly watered trees will not pay for labor and capital invested. In cases where the fruit grower contemplates growing fruit for mercantile purposes, the matter of water should never be overlooked.

If these suggestions be strictly observed and adhered to, there will be more small orchards in Kansas than hitherto and fewer commercial orchards, and a much higher grade of fruit will be put upon the market and a better grade consumed on the ordinary farm. It is a well-known fact that ground set out in trees that seldom bear a good grade of fruit will pay much better devoted to growing of alfalfa.

In the meantime, it will be important not to neglect the planting and culture of hedges and windbreaks as a means of economizing moisture, especially in central and western Kansas. While these windbreaks take up some space, they spread and lighten the force of our high winds, and are well worth all and more than they cost.

It has not been the purpose of the writer to offer an exhaustive paper upon the subject herein discussed, but to be as far as possible suggestive, by giving simply a bird's-eye view of the past, present and future of horticulture in the state.

F. L. KENOYER: Doctor Bohrer's paper mentions compulsory spraying. There is one thing that needs to be made compulsory before spraying, and that is the cutting out of all our hedges; that is, cutting out the wild cherries that are growing along the draws and fences and other places that are every year loaded down with tent caterpillars and other injurious insects, and it seems to me that would be the place where compulsory work should begin. In regard to Mr. Whitney's article, he said that the government should grow and furnish farmers with their seed. It seems to me they are doing better than that now; they are furnishing it free.

ALBERT DICKENS: Perhaps only one or two men here have known Doctor Bohrer longer than I have. My father and Doctor Bohrer were neighbors; that is, they lived fourteen miles apart, and that meant neighbors thirty or forty years ago. I know Doctor Bohrer has done a great work in that part of the state. He did not select a location that was

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desirable. It was a hard place to start fruit trees. In the early days Doctor Bohrer had, perhaps, the best-planted place in Rice county. Doctor Bohrer has been a good man.

It seems to me that the past of this Horticultural Society is a matter in which the whole state is proud. The questions of the future are the questions for us to consider to-day, and it seems to me that this society ought to keep up in the future the work it has done in the past. The history of the horticulture of Kansas is written in the reports of this society. Any man can go into the libraries of this state where the reports of this society are found and dig out from the reports of these meetings the horticultural history of this state, and the discussions regarding varieties will put a man right in most parts of the state. Questions of control of diseases are just as important to-day as they ever were; perhaps more so. This society ought to get behind any good that will tend to force the better growing of fruit; that will tend to force the better packing of fruit; that will guarantee that any fruit packed in Kansas is as good as that packed anywhere. And again, we ought to go on with this work of helping to secure better concessions from the transportation companies. Three or four men are now in the public utilities office working over some concessions the railroads are supposed to make in shipping culls. It seems to me that question could be decided mighty readily by this society. The cull apple ought to be any apple that is not good enough to pack. If it has a spot of bitter rot or blotch it has no business to go into cold storage.

We ought to have a realization that there is room in Kansas for thousands of small orchards. You go to Wathena any day between the first of May and the last of September and you will see hundreds of teams lined up there waiting to unload. They are bringing berries, ten or fifteen boxes of grapes perhaps, and they are just as much entitled to the best price we can get as the large grower. Any community anywhere is better off with a thousand acres distributed among one hundred men. You look at the men in this state who are carrying the loads of the big orchards, and you will see it is hard on them. They carry an awful strain; from the first of May to the first of October they have got to meet the pay roll, and an orchard of that size is an industry which the community ought to get behind and help all they can. The history of the Northwest ought to show that we have got to capitalize our orchards heavier. For one five-acre orchard it is pretty near a job for one man to see that that is taken care of. A man should go in there day after day, and see if this branch needs a little thinning here and there, as the cherry growers have to work; not let it go four or five years and then take an ax to it. The men who are carrying on investigations learn something new every year, if they keep their eyes open.

I would like to see this society have at the fairs in Topeka and Hutchinson a packing school, such a school as they have in the Northwest. I believe it would be worth more to Kansas than any exhibition of our apples that we could put out at our fairs. I believe the fairs would help this thing. The Horticultural Society's representative could say to the fair management, "The State Horticultural Society wants to coöperate with you, and if you will pay your share we will pay our share," and we will perhaps have a packing school for a whole week at Topeka and perhaps at Hutchinson.

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PRESIDENT TREDWAY: The chair has a letter of inquiry from Wakefield. The party has blasted out with dynamite his old orchard, and he wants to know what he can set again, and can he set trees again in that old orchard?

PROFESSOR DICKENS: Tell him to sow it to alfalfa. A man who is going into that has taken a load which he had n't better carry. He had better be slow. I believe, from my experience with old orchards in Kansas, that there is n't an old orchard but what has woolly aphis. He asks, What shall I do with my old orchard? To be honest with him I would tell him to put it on the wood pile. A good young apple tree is worth more than those old ones. Cut back and cultivate. Put in some wood ashes. Don't let him grub out his old orchard if it is worth keeping, as long as the bark is good and sound. I don't believe, if he is inquiring, that he has blown out that old stuff.

A. H. GRIESA: Planting trees of the same variety where trees have died out is poor policy. I knew a man, one of my neighbors, who had a large orchard. It bore years and years, and any amount of manure and fertilizers he piled on the ground, but when his trees died he tried to replant them. He tried for four or five years. I furnished him the trees. The trees invariably died; refused to grow, even. He waited until about ten or fifteen years and then planted on that ground, and those trees did well, but you can not grow apple trees where apple trees have died. Alfalfa or clover, to renew your land, is very essential.

A MEMBER: I will make a motion, Mr. Chairman, that the portion of Mr. Pollard's expenses to St. Louis at the present rate meeting falling on the Kansas growers be defrayed by the Horticultural Society out of the funds of the Horticultural Society. There were four states represented by Mr. Pollard.

The motion was duly seconded, put by the president, and carried.

J. L. WILLIAMS: The subject that you have talked upon for the last hour—Doctor Bohrer's paper, "The Horticulture of the Past, Present and Future"—told of the first old trees. All of them are about dead and gone, and the letter from Wakefield is right in that same line of thought. I want to make a motion that the secretary be instructed to answer this letter and say to him that, in the estimation of this society, no difference how well he has dynamited that orchard, nor how much the fumes have passed through the ground, we believe, as a society, that it is better for him to plant other crops in there for at least a few years—either grains or some leguminous crops. If he does not wish to wait, take new ground and plant his orchard.

J. J. ALEXANDER: I would like to second Brother Williams' motion.

J. L. PELHAM: I am in favor of this. I think we are doing right. I want to explain myself a minute. I believe with Professor Dickens to an extent, and I want to explain my ground. My experience is different from other people's experience. I believe, with Professor Dickens, that if a man has got room he had better plant elsewhere. Although I have had success in planting in the same place, I may prove in the future that I can not do that. It is best, possibly, to put in alfalfa, though I do not believe for ten or fifteen years. I believe we are on the right road when

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we answer the correspondent in that way. Even though it is against what my experience has been as a young man, I believe we ought to tell that party that it is the general sentiment of people who have had wide experience in that line.

WALTER WELLHOUSE: On that line I would say that there have been quite a number of letters addressed to this office in regard to that very subject. In our orchard experience of some forty years we came to the conclusion that it was not worth while to plant a new tree in that orchard after the old one had grown there five years. The period might be extended a little longer than that on rich bottom land; but take it on the average orchard here, I do not believe it best after a tree has been planted five years, and we generally answer our correspondents in that way.

J. J. ALEXANDER: I think he would find more difficulties than that. He would have all those insects to contend with that were in the ground, and gases that have destroyed his old orchard; so I think he had better commence in a new place, for I have had experience, and it was n't very satisfactory.

E. E. YAGGY: With regard to this rate question. I think it is pertinent that we should have a committee of men who represent this society; men who are interested and who know how to go about getting these rates. Some of us would n't know how to go about it. Some of these men have already been before the Interstate Commerce Commission and know how to get these rates, and they could do more in a week than we could in a year. Therefore, I make a motion that the chair appoint a committee of these level business fellows who know about these things to represent this society in getting rates.

PRESIDENT TREDWAY: I would like to say, gentlemen, that would be all right if you would allow the chair ample time to make this selection.

F. W. DIXON: There are a good many things this committee might do. They will have their hands full. I have been before the State Board of Utilities and before railroad rate men. There is one thing we have to take into consideration, too, that lots of us fruit growers grow mixed crops. We have to change our land off to grow cabbage, potatoes, and one thing or another, yet we can not ship mixed carloads in this state. On a carload of mixed products they would take the carload rate of each single product. I got caught on that. I shipped a mixed carload of apples and potatoes, and had to pay two freights. The railroads say the reason they won't do these things is because it takes so much time to handle the tariff work. I believe it is the dawning of a better day for horticulture in Kansas. It will take some money. You will find somebody has got to put up a little money.

GEO. O. GREENE: I would like to say for the benefit of Mr. Dixon and Mr. Griesa that the correspondence I had with them along certain lines was taken up Tuesday by Mr. Pollard. I would like to say Mr. Dixon and Mr. Griesa have done everything they could do to aid us in our work, and we certainly feel very thankful to the people who have helped us out. I might say that when I started into this I did n't know a railroad rate from a poor crop. Sometimes we find out a good many things we did n't know before. You will find that Kansas pays the

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highest rate on apples and potatoes of any state in the Missouri valley, and yet we have just sat down and allowed those things to exist. There never has been an organized effort, and the ability of an organization to do things is simply the whole people getting behind it.

ALBERT DICKENS: I want to say just another word. My judgment, from what little observation I have had, is that this is one of the biggest things this society ever tried to tackle. I believe this is the greatest thing in American commerce to-day, this adjustment of rates. I think from what I have gathered from rate men and apple men that the whole system of railroad rates has grown up; that they started when the road first went through here on the good old principle of charging all the traffic would bear; that the railroads do business on some things for less, perhaps, than they can afford to do it. In the matter of broken shipments, getting mixed shipments and the matter of insurance, what scares the traffic manager is the classification. Why should apples take a higher classification than cattle? The carload of apples does n't cost anything like as much for care. Does n't cost anything like as much if they are going to insure the shipment. "It is so because it is so," our agent told me once; an answer that does n't satisfy a man who has the germ of investigation in his soul. With a carload of stock, in case of a delay or wreck, somebody has to look after those hogs, and they may have to be unloaded and then loaded again. A carload of apples can lie there for a week; and that matter of classification, I believe, is the big thing, and we are just starting something. It seems to me that this Horticultural Society ought to start into this thing that this transportation committee has, the biggest thing they ever tackled. If they report progress in a year they will do well.

Mr. Williams's motion in regard to paying the expenses of Mr. Pollard to St. Louis carried.

REPORT OF DELEGATE TO THE AMERICAN POMOLOGICAL MEETING AT WASHINGTON, D. C.

By A. H. GRIESA, Lawrence.

Mr. President: I attended the American Pomological Society meeting at Washington, and as I told members of our Horticultural Society, that was enough in itself. I think the attendance was a little larger than our state meeting; it was not a large number in attendance, but it was a select number. They were people with the highest of horticultural knowledge, using it to the best advantage. Of course there were some visitors and they had some trouble in discussing questions. It is as difficult for the American Pomological Society to arrive at all the conclusions of knowledge as for us here.

The display of fruit was fine, as far as it went. It was mostly apples and tropical fruits, citrous fruits; there were hardly any pears there; a peach or two. The apples were nice, and it made me feel as though I wanted to try to get something twice as good as they had and put it up in nice style. Of course, expert care had been used in picking and packing it, and expert visitors looked at it.

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J. L. WILLIAMS: I would add a few words to Brother Griesa's talk about the American Pomological Society. It is the greatest horticultural society of scientists there is in the United States. The United States, Canada and Central American states were together at that meeting at Washington, and the display was very fine of new varieties. The northern Canadians were there with a large number of varieties adapted to the country way up near Hudson's Bay country. The nut growers from the South—why, they were wild as boys over the new business, and the Florida, Texas and Louisiana oranges. They were very enthusiastic over their affairs, and the people from Florida were extraordinarily enthusiastic. They had many new varieties of those southern fruits, and they were growing large quantities of those fruits in the South. There were something like 450 new varieties, it was stated. West Virginia had a large number of new varieties, and they were very enthusiastic over their part of the country. Of course, a great deal of the country had a season like we had here this year. One man from New Jersey gave us a talk on strawberries. Now in talking of strawberry raising as an occupation he made the statement that there were sixteen million dollars' worth of strawberries raised in the United States in one year. I put that down as quite a little item, but after he and some others had gotten through I happened to think about the subject myself. It struck my mind that there is n't a fruit in the United States as extensively planted, from the North to the South and the East to the West. There is n't a place where they can not raise strawberries, and there is no other fruit that grows all over North America; that grows everywhere. There is no other fruit planted in the United States that can be grown as easily as strawberries, nor over so large a territory. Sixteen million dollars' worth sold in a year made quite an item.

There were a great many scientific men there from our colleges and from the Agricultural Department at Washington. The fruits were exhibited in quite a large room in the new museum that has been built in the city of Washington, and during some of the sessions it was practically impossible to get in there. You had to get in by ticket. There were a good many people in Washington who were not members, who attended the meetings.

Brother Griesa had his pear there. I thought it was very nice. He was too modest to say anything about it. This meeting was held from the 17th to the 21st of November.

ALBERT DICKENS: Two things that particularly interested me will be of interest, perhaps, to Kansas growers. One was the exhibit of Crosby apples exhibited by the Mountain Grove, Mo., Experiment Station. It is a cross between the Jonathan and Ben Davis apple. The hope was to get an apple as handsome as the Ben Davis and all the good qualities of the Jonathan. I spent all the time I could spare on that collection. One thing that struck me was that the Ben Davis has a possibility as mother of this apple, marking the offspring more noticeably than the others. The Ben Davis is a notoriously poor father. Does not make a good supply of pollen. That has been noted by most observers in crossing apples, while the Ben Davis is the most prolific pistillate parent. It resembled the Jonathan least in form and most in weight; specific gravity, perhaps, is

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a term we could use. It was more like the Ben Davis in compactness. The Jonathan was noted in many of them. The other point was in the matter or breeding persimmons. Hurley Hume, of Florida, has been working on persimmons for a number of years now, and we have done a little in persimmon breeding in this state, and we have failed many times, but Hume has got a type of the American persimmon crossed with the Chinese persimmon with good qualities. Hume tells me that there has been absolutely nothing but failure. But in the work along this line a good many fairly desirable seedlings of the American persimmon have been developed. Some with fewer seeds, some of larger size. Those two points particularly interested me at the American Pomological meeting.

SECOND DAY—Evening Session.

TRANSPORTATION AND STORAGE OF FRUIT.

By GEO. M. DARROW, U. S. Department of Agriculture, Washington, D. C.

Fruit transportation and storage investigations constitute one branch of the pomological work of the U. S. Department of Agriculture. Experiments under the direction of this office were begun in 1901, and to the present time have included work with apples, pears, peaches, plums, cherries, grapes, the citrus and other subtropical fruits, and many of the small fruits. Certain problems connected with the transportation and storage of the fruits mentioned are still being studied. Many other kinds of fruits are not yet used extensively because of some factor or factors which limit their distribution.

Thus until a year ago the length of the marketing season of California grapes was limited to about 60 days. The office of fruit transportation and storage worked out the method of packing certain varieties in redwood sawdust by means of which the marketing season of 60 days has been extended to 120 or 150 days. This country imports grapes for winter marketing to the value of millions of dollars annually from Spain. This new method of packing grapes for shipping and storing will make this country less dependent on the Spanish supply during the earlier months of the winter. In 1912 thirty cars of grapes packed in redwood sawdust under the direction of the bureau staff were shipped from California to eastern markets and stored for the Christmas trade. The shipment was successful and this year has been more than doubled. This is simply an instance, and a very successful one, of the work of this office.

COLD STORAGE A NECESSITY.

Within the memory of many here, fruit growing was a comparatively small industry. Fruit was grown for the consumption of the immediate family. Each family had its own supply and this supply did not last long. Towns and cities were supplied for a short time only at the season of maturity of each fruit. With the extension of the railway facilities came a greater demand for fruit and a great extension of fruit growing as a commercial enterprise, for the fruit could be more safely brought to market. With the rapid growth of fruit raising have developed methods of extending the period of consumption of fruits, until now apples, oranges

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and other fruits may be purchased throughout the year in nearly any market of the country.

Last year the apple crop of this country was approximately 42,300,000 barrels. Without cold storage this entire crop would have had to be marketed within a short space of time. Not only would the waste have been enormous but growers would have received little for their fruit. Also for a long period there would have been no apples for consumption. Besides the short season of marketing, the apples could not have been sold in certain large sections of the country without the assistance of refrigeration and cold storage.

The actual conditions were that approximately 8,000,000 barrels were placed in cold storage and 3,000,000 barrels were exported. Cold storage is then necessary to the fruit industry because it lengthens the season of marketing the crop and because it increases the territory over which fruit can be marketed.

With the great increase in planting orchards in this country there must be a still further extension of cold storage. In certain sections of the country the proportion of nonbearing trees to bearing trees was three to one when the 1910 census was taken. Taking the country as a whole, according to the same census, there were 43 apple trees not bearing to every one hundred that were bearing. This great increase in planting has continued in many sections, and to market this future increase in apple production properly a large part must be placed in cold storage.

Fruit industries are growing up in each section of this country, and when there is a fruit crop in one section fruit from other sections will not be in great demand there. Again, if in a season as in 1912 all sections growing a certain kind of fruit like the apple have a crop, there will be a much smaller demand for apples in apple-raising sections until a great quantity of medium quality fruit be consumed. In such a season cold storage will be called upon to hold a large amount of fruit for a long period of time. To cold storage we must look for assistance in relieving gluts in the market and depression of prices. With increased production more and more fruit must be placed in cold storage to distribute its consumption evenly throughout the year. With better methods of preparing fruit for transportation and storage, and better methods of transporting and storing fruit, will come a greatly increased demand for fruit, spread over a longer period of time and over a wider territory. Fruit will gradually become a more common article of diet for all.

METHOD OF CONDUCTING THE INVESTIGATIONS.

The investigations of this office are directed toward the working out of the principles governing the transportation and storage of fruits. The work is carried still further and demonstrates that the principles are applicable to the commercial practice. The experiments are conducted on a scale approaching commercial conditions. They are also continued through a series of years until all, or as many as possible, of the conditions affecting the experiments are met. Thus the apple-storage investigations were begun twelve years ago, and are still being carried on. At first the apple-storage experiments were carried on in the eastern and central states, and many of the principles governing the successful

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storage of apples were there worked out. Now the experiments are being continued in the states of California, Oregon, Washington and Idaho. Hundreds of boxes of apples are being picked, packed, placed in storage, and examined through a long season.

In Oregon the principles of the successful storage of pears are being studied. In Georgia the relation between careful handling and precooling, and the amount of decay in peaches shipped to northern markets, is being worked out; and during the past year transportation and storage problems connected with other fruits in various parts of the country have been studied.

PRINCIPLES OF FRUIT TRANSPORTATION AND STORAGE.

I will give briefly some of the principles of successful transportation and storage of fruits, and show some of the recent results of the investigations of the Department of Agriculture in this work.

A fruit is a living organism. It carries on the life functions through growth and maturity to its death. When the pistil of an apple blossom is fertilized the life of the normal apple begins. The fruit passes through the period of growth and reaches maturity on the tree. At maturity it is picked. If it be a long-keeping variety the ripening process goes on slowly. After the fruit is ripe, death begins. While the life functions are active the fruit is alive and is fit for food. When those functions cease, death ensues and the fruit becomes unfit for food. The length of life depends on the conditions surrounding that life. Stage of maturity when picked, temperature, moisture and air are the chief factors influencing the length of the life of the fruit after picking. If the fruit is picked too ripe, it means that the life functions have gone so far that the fruit has but a brief period of life left. Also, if the fruit is picked when immature, the life period is shortened. The leaves elaborate food for the fruit tissues, and if this supply is cut off by picking the fruit before maturity weak fruit is produced, which goes through the life processes more rapidly than mature fruit.

A high temperature accelerates the changes taking place within the fruit. A low temperature retards those changes. Thus the length of time that a fruit remains warm after picking and the temperature at which it is stored affect the length of the life of fruit. It has been found that temperature is the principal factor in the keeping of fruit. Fruits in their life processes use oxygen from the air and give off carbon dioxide. The fruits that do not keep long show great activity in this process. In fruits like the apple this action is much slower. Recent investigations by the Bureau of Chemistry show that for every rise in temperature of 20° F. the respiration process increases more than two and a half times. Thus for each 14.7° F. increase in temperature the activity of the respiration of the Gandy strawberry is doubled. For each 16.9° F. increase in temperature this activity in the Summer Pearmain apple is doubled. The process of respiration and the activities connected with it seem to be the chief factors in the ripening of fruits. To check ripening, then, we must lower the temperature of fruits; and we can reduce the activities and the rapidity of ripening by half by each reduction in the temperature of the fruit of about 14½° F.

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Cold storage is used to hold fruit at a low temperature to retard ripening. Upon the storage temperature and upon its constancy depends its efficiency. If the temperature of the storage is 47° F., it retards the ripening just half as much as a temperature of 32° F. It is for this reason that common storage is not as efficient as cold storage, for it will not hold the fruit at as low a temperature and hence will not retard the ripening as much. Common storage has not as constant a temperature as cold storage. When warm fruit is put in a cool place it requires a certain period to give up its heat. Meanwhile the ripening process continues. If the difference between the temperature of the fruit and the air of the storage room is great the temperature of the fruit will be lowered quickly. If that difference is slight the fruit will be cooled slowly. The processes of ripening are continuing at full speed when the fruit is picked, and consequently the temperature should be lowered rapidly. Cold storage has here a great advantage over common storage, for by reason of the great difference in temperature between the fruit and the air the fruit is cooled quickly. Moreover, when the weather is warm in fall, and the temperature of a common storage house is raised, it will be a considerable time before it cools again and much ripening will have taken place. There is no such danger in cold storage. When fruit is to be stored for a considerable period, cold storage must be used to make sure the fruit will keep properly. Common storage may be used to keep fruit for shorter periods where cold storage is not available.

Death comes to fruit in another way than by the natural cessation of the life functions. Disease may attack the tissues of the fruit and kill it. The diseases are caused by living organisms called fungi which grow in the tissues of the fruit. Fungi are plants, many of which have the power to live in other plants. Certain fungi may grow in the living cells of fruits, killing the fruit as they grow. They spread by means of spores, which correspond to seeds in other plants. These spores are very small, and a single diseased apple may have millions of them on its surface ready to be spread by the slightest breath of air. These spores must have moisture and a fairly high temperature in which to develop. There are two classes of these diseases—those which penetrate the unbroken skin of a fruit, and those which gain entrance only through injury to that skin. To the first class belong the brown rot of stone fruits, the bitter rot of apples, and other less known diseases. The great majority of the diseases affecting fruit in storage belong to the second class and must have an injured fruit on which to work. Blue mold is the most common fungus in this class. The low temperature which it is possible to use in cold-storage rooms will not kill fungi. Low temperature can only retard their development. If a partially decayed apple is put in cold storage the decay may spread gradually in the storage, and on withdrawal from storage develop rapidly. If a fruit with an injured skin is placed in storage, certain molds which can grow in very low temperature may start decay and this decay develop very rapidly upon withdrawal. Low temperature will retard the development of brown rot and bitter rot, but if the spores of these diseases are present they become active when the temperature is raised; and the condensation of moisture on the fruit following the rise in temperature affords ideal conditions for the rapid spread of this class

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of fungi. Then cold storage of fruit can not correct poor management of the fruit crop before it reaches the storage. Cold storage can assist, to a degree, in holding in check the spread of decays. But the chief function of cold storage is to assist in the distribution of properly grown and properly handled fruit through a long marketing season.

The progress of a fruit crop from the tree to market is now recognized as having four stages:

1. The productive stage: *i. e.*, the growing of the crop, including the selection of varieties, planting, cultivating, pruning, spraying, irrigating, fertilizing, etc.

2. The market preparatory stage: picking, grading, packing, hauling, loading and cooling.

3. The transportation stage: cooling, refrigeration or ventilation, railway hauling, switching, etc.

4. The marketing stage: distributing to markets, and selling, advertising to increase consumption, etc.

Successful shipment and marketing of a fruit are dependent upon the proper growth and harvesting of that fruit. Varieties that fulfill the purpose for which they are grown, trees set in soil suitable to tree growth, cultivation of those trees to provide a proper supply of moisture, air and plant food, spraying to prevent the attacks of insects and diseases, fertilizing to supply sufficient plant food for the proper development of the tree and crop, pruning to insure sunlight, a strong tree and a tree that will not injure the fruit—these and other cultural operations are necessary for the production of fruit of a character fit for cold storage.

The productive stage has been the subject of investigation by the state experiment stations and by the United States Department of Agriculture for many years, and a great many of the different factors governing the successful production of good fruit are fairly well understood. Thus to guide the fruit grower in his selection of varieties for a particular purpose, as for placing apples on the winter market, each state station recommends varieties for that state. The Office of Fruit Transportation and Storage has published the results of a series of storage experiments with apples, and in that bulletin can be found the approximate storage limit of the different varieties. This work is being continued. Again, if the soil is lacking in humus the moisture can not be readily held in the soil, and fruit not properly grown will be produced. Weak fruit will not keep as well as that properly grown. If the soil has an oversupply of nitrogen, or if the fruit is borne on young trees, or if there is any other condition which causes the development of fruit of large size for that variety, the fruit will be physiologically weaker in character than fruit of normal size and proper development for the variety.

When the fruit is not sprayed the spores of fungi which can penetrate an unbroken skin will be ready to develop under favorable surroundings. Any condition which allows even a slight condensation of moisture on the fruit will furnish the proper environment for their development. In storage rooms the air usually contains enough moisture to allow the spores to germinate. Also fruit that is not sprayed usually has a large

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number of small injuries caused by worms and other insects which are not seen in ordinary grading. All skin breaks are, however, large enough to allow the entrance of fungi. No amount of care in handling and storage can remedy this lack of spraying.

Where the trees are not pruned the wind will injure much of the fruit and the dense foliage will prevent the proper coloring and maturity of the fruit. In experiments made by the bureau staff, green, immature fruit from the interior of a tree was found not to keep as well in storage.

All these operations just mentioned are connected with the cultural stage and must be conducted intelligently in order to have good fruit for harvesting.

After the fruit has been grown properly it must be properly prepared for market. It is here that the fruit grower must add to the qualities of a farmer, the qualities of a business man. Each operation—picking, grading, packing, hauling and loading—must be done in accordance with market demands, and yet, if the fruit is successfully marketed, it must receive the same careful attention through each of these steps as during the growing period. To the relation between injury in these operations and the later keeping quality little attention has been given by the orchardist. One reason for this is that he expects to dispose of the fruit as soon as it is packed. With the growth of the cold-storage industry, however, many are storing their own fruit and can see the effect of careless handling on the fruit in storage. Though the management of the fruit in transit and storage is important, the proper preparation of that fruit for market is also important and governs the behavior of the fruit while in transit and in storage. The general principles developed from investigations in fruit transportation and storage are:

(1) That there is a definite relation between the character of the handling of the fruit in preparing it for market and the occurrence of decay or deterioration in transit, on the market or in storage.

(2) Most decay which occurs in transit and storage follows injuries made in handling and preparing the fruit for shipment. The molds which cause most of the decay begin at injuries of various kinds in the skin of the fruit; after the decay has started within the fruit tissues there is no practical method of controlling it. The damage done can not be repaired, and the development of the decay within the fruit can not be stopped even by holding the fruit at a temperature as low as 32° F.

(3) The temperature of the fruit must be promptly and rapidly lowered. This naturally depends upon the temperature conditions existing at the time the fruit is picked, as it is more important that fruit picked in warm weather be cooled quickly than fruit picked in cool weather when the life processes are already retarded.

Thus the fruit must be picked with the minimum of injury to its skin by ladders, by the pickers and by the picking utensils. The fruit must be picked at the proper stage of maturity even though this means picking over the trees several times. The grading utensils must be so made that no bruising of the fruit occurs, and all injured and over-ripe fruit must be carefully graded out. In the packing, whether in barrels or boxes, care must be taken that apples or other fruits are packed firmly but not bruised.

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Again, the temperature of fruit after it is picked must be promptly lowered to check the ripening processes. This applies to all fruits as far as the investigations have progressed. Growers of many kinds of fruits have held that it was better to leave the fruit exposed to the sun or normal temperatures for a time after picking. In every case, however, this has been absolutely disproven and the practice found to be positively injurious.

The ideal in harvesting fruit would be to pick the fruit with one hand and place it in cold storage with the other. The nearer we approach this ideal the greater will be our success in holding fruit in storage.

RASPBERRY HANDLING EXPERIMENTS.

The following tables and discussion will show how our experiments have been conducted, how the foregoing principles work out, and indicate some of the results of recent investigations with a very tender fruit, a tender fruit, and a longer keeping fruit. These tables translate some of the principles stated above into definite figures showing their value to you as practical orchardists. Then you can see for yourselves whether it is possible to guide your practice by these principles.

During the season of 1911 a study of the factors governing the transportation of raspberries and blackberries from the Puyallup valley, in the state of Washington, to distant markets through the Middle West was begun. This work was continued in the season of 1912, and a full report is soon to be issued by the United States Department of Agriculture.

The berries are shipped by the growers in refrigerator cars from Puyallup and Sumner, Wash., to points as far east as Omaha, Fargo, and St. Paul. The deterioration of berries between the shipping point and market consists of decay from molds, and a softening so that the fruit is unfit for use. The problem was, therefore, to determine the causes of the deterioration and to work out methods of checking that deterioration.

The experiments of the bureau workers were planned so that a comparison of raspberries very carefully picked and handled to insure the minimum of injury might be made with fruit from the same plantation, picked and handled in the usual commercial way. The two lots were taken to the station and held in an iced refrigerator car there for four, six, and eight days, representing trips of as many days. At the end of

TABLE I.—Red Raspberry Experiments at Puyallup, Wash., season of 1911. Average percentage of decay and total deterioration in carefully handled and commercially handled lots.

TIME IN ICED CAR.	Decay.				Total deterioration.			
	On withdrawal.		One day after withdrawal.		On withdrawal.		One day after withdrawal.	
	Careful handling.	Commercial handling.	Careful handling.	Commercial handling.	Careful handling.	Commercial handling.	Careful handling.	Commercial handling.
4 days.....	0.1	1.4	0.6	12.3	0.4	4.6	1.0	17.5
6 days	0.2	6.2	3.5	27.6	0.2	9.9	3.8	31.9
8 days.....	1.7	22.3	7.8	45.1	2.2	26.7	8.1	47.6

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four days a part of each lot was taken from the car and examined at once, and again one day later. A second part of each lot was withdrawn from the car at the end of six days, and a third lot at the end of eight days. The decayed and softened fruit was carefully sorted out and the exact weight of the loss determined.

DISCUSSION OF TABLE.

It will be noticed that the percentage of decay and deterioration found in the carefully handled lots was much less in every case. In fact carefully handled berries at the end of eight days had approximately the same amount of decay that the commercially handled fruit had at the end of four days. The significance of these figures is that if red raspberries can be successfully shipped 2000 miles when handled in the usual commercial way, then they can be shipped twice as far if carefully handled. it will be noted that the carefully handled lots held up well after being stored eight days while commercially handled fruit decayed rapidly upon withdrawal and was soon unfit for use. The reason for this rapid decay in the carelessly handled fruit is that any injury to a berry will allow the fungi to develop. The fungi penetrate the delicate cell walls and the juice of the berry escapes. This juice wets the neighboring berries and the fungi develop in them. If a comparatively large amount of the berries are injured, there are so many more centers from which the diseases may spread. The berries must remain in good condition for at least a day on removal from refrigeration if they are to be successfully marketed.

This principle, that fruit must remain in good condition after arrival on the market long enough to get into the consumers' hands, governs the marketing of all fruit, whether it be a long-keeping fruit like the apple, or a fruit with a short life such as the raspberry. These investigations show the relation between the handling of a fruit before going into storage and its behavior upon withdrawal from storage. The importance of this principle is shown in the rapidity and extent of the decay in the commercially handled raspberries as shown in the above table.

The decay and deterioration in berries result from injuries received in picking by crushing and from including over-ripe berries in the baskets with sound fruit. The injuries are made by bruising and breaking the berries when picking them. Injuries are also caused by the picker's holding several berries in his hand before putting them in the basket. Again, injury is caused by sorting over filled baskets to remove leaves or over-ripe fruit.

In commercial practice, much bruising is avoided by the use of three fingers instead of two in picking the fruit, for the pressure is thus distributed over a larger area. No broken or crumbled fruit should be placed in the baskets. The picking must be done regularly in order that no over-ripe fruit be shipped. When such precautions are taken, the berries will carry to such markets as shipping rates allow.

CHERRY HANDLING EXPERIMENTS.

During the season of 1911 experiments were conducted at Salem, Ore., to determine the factors which limited the successful shipment of cherries from that section to the far-eastern markets. As with the berries, carefully picked lots were secured from orchards at the same time with fruit

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picked by the regular crew. The cherries were then taken to the packing house and packed by the bureau representatives. Besides packing the fruit carefully, all cracked and damaged fruit was culled out.

The fruit picked in the usual way was packed by the regular packing-house force. Both lots were placed in an iced car at Salem and held there for five, ten and fifteen days.

TABLE II.—Average percentage of decay in carefully handled and commercially handled cherries at Salem, Ore., 1911.

TIME IN ICED CAR.	On withdrawal.		Two days after withdrawal.	
	Carefully handled.	Commercially handled.	Carefully handled.	Commercially handled.
5 days in car	0.5	2.8	3.5	10.8
10 days in car	1.5	12.3	3.5	21.4
15 days in car	4.3	16.0	7.3	26.1

This table also shows that the amount of decay found in the carefully handled lots was much less than in the lots prepared in the usual way. As the season was an unusual one in that more than the average moisture fell during the maturing of the cherries, the percentages of decay are high. But it will be noted that after 15 days in the car the decay in the carefully handled fruit was small, while the commercially handled fruit had reached the limit of economical marketing before ten days had passed. As with the berries, the decay of cherries follows injuries received in handling. When the cherries are picked they should be handled by the pedicel or stem only. The picked fruit should be placed in the picking utensil rather than thrown or dropped into it. The lug box in which the fruit is placed to be carried to the packing house should not hold a large amount of fruit, as the weight of the cherries above will bruise those below. The lug box should have a smooth surface, or be lined with a soft material. When the cherries are packed, all cracked and injured fruit should be discarded. Care must be taken that the fruit is firmly packed, yet not crushed.

Experiments with fresh prunes at Salem, Ore., during 1911, showed almost equal advantage in favor of careful handling.

NORTHWEST APPLE STORAGE.

Apple-storage work was started in the Northwest two years ago. Because of the organization of the apple industry in this section it was possible to plan a comprehensive investigation of the various problems confronting the growers. Among the points to be studied were the length of time of storage of each variety of fruit, the effect of delayed storage, the effect of the soil types, the time of picking, the relative keeping quality of large and small fruit, green and well-colored fruit, fruit from old and young trees, and fruit from irrigated and nonirrigated trees. The organization of the work was similar to that in the former experiments. Hundreds of boxes of fruit were picked, packed and stored under the supervision of the representatives of this office. The fruit was held in storage for different lengths of time and examined upon withdrawal and after holding ten days under ordinary market conditions.

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One of the principal causes of losses in the storage of apples is scald. Scald is not caused by an organism, but is closely connected with conditions under which the fruit is held and seems to be connected with life and death changes in the fruit. Mr. G. H. Powell, formerly connected with the Office of Fruit Transportation and Storage, conducted experiments to determine the factors influencing the development of this trouble in the Eastern States. Later investigations confirm his conclusions. He found that immature, partly colored fruit was much more susceptible to scald than mature, well-colored fruit; that the ripening that takes place between the picking of the fruit and its storage makes it more susceptible to scald; that fruit scalds least in low temperatures, and the development of scald after removal from storage is directly affected by the outside temperature; and that a temperature of 31° to 32° F., is the best for keeping the fruit.

The following tables show some of the results of the storage experiments in the Northwest:

TABLE III.—Percentage of Scald developed on Yellow Newtown apples; Northwest Apple Storage Experiments, 1912-'13.

	Jan. 8.	Feb. 19.	April 1.
On withdrawal:			
Immediate, 32° storage	0.0	0.0	2.9
Delayed ten days, 32° storage	0.0	0.0	5.8
Immediate, 35° storage	0.0	4.5	12.3
Common storage	0.0	19.6	60.0
Ten days later:			
Immediate, 32° storage	0.0	0 0	22.4
Delayed ten days, 32° storage	0.0	2.7	29.0
Immediate, 35° storage	0.0	7.1	27.5
Common storage	4.3	29.5	90.7

In this experiment the Yellow Newtown did not keep well in common storage beyond the inspection of January 8. For keeping through a long storage season 32° F. was a better holding temperature than 35°.

TABLE IV.—Percentage of Bad Scald developed on mature and immature fruit. Northwest Apple Storage Experiments, 1911-'12 and 1912-'13.

	Yellow Newtown.				Winesap.		
	Jan. 7.	Feb. 19.	Mar. 28.	May 12.	Jan. 16.	Feb. 21.	Apr. 2.
On withdrawal:							
Immature fruit	0.0	0.0	1.8	3.9	0.0	9.8	30 7
Mature fruit	0.0	0.0	0.0	1.3	0.0	0.0	0.0
Ten days later:							
Immature fruit	0.0	2.7	20.5	31.2	2 3	13 4	30.7
Mature fruit	0.0	0.0	8.1	22.9	0.0	0.0	4.3

The percentages given include only specimens sufficiently affected by the trouble to detract from their market quality. There were, as a rule, a number of slightly affected fruits, but as these cases would not be considered in commercial practice, they may be omitted from consideration in this discussion.

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TABLE V.—Percentage of Bad Scald developed on mature and immature Rome Beauty apples; Northwest Apple Storage Experiments, 1912-'13.

	Series No. 1.			Series No. 2.		
	Jan. 8.	Feb. 18.	April 1.	Jan. 8.	Feb. 18.	April 1.
On withdrawal:						
First pick	0.0	5.3	55.4	0.0	40.0	80.0
Second pick	0.0	0.0	0.0	0.0	0.0	43.2
Third pick	0.0	0.0	0.0	0.0	0.0	0.0
Ten days later:						
First pick	52.7	64.9	92.8	79.5	84.0	57.5
Second pick	0.0	0.0	0.0	34.1	40.9	45 5
Third pick	0.0	0 0	0.0	0.0	2.3	15.9

The fruit in the second pick of series No. 2 corresponds to that in the first pick of series No. 1, the fruit in the two series being obtained from different districts.

DISCUSSION OF TABLES.

Evidence of the importance of picking the apple at the proper stage of maturity is clearly shown here. No discussion is necessary.

TABLE VI.—Percentage of Jonathan Spot developed on Jonathan apples; Northwest Apple Storage Investigations, 1912-'13.

	Nov. 30.	Jan. 4.	Feb. 15.	Mar. 28.
On withdrawal:				
Immediate, 32° storage	0.0	0.0	2.5	10.7
Delayed, 32° storage	0.0	0.0	8.7	28.7
Immediate, 35° storage	0.0	0 0	6.7	13.3
Common storage	0.0	16.7	26.4	54.3
Ten days later:				
Immediate, 32° storage	0.0	0.0	15.9	22.0
Delayed, 32° storage	0.0	2.2	42.7	62.7
Immediate, 35° storage	0.0	1.4	13.3	34.0
Common storage	0.0	25.4	50.3	62.3

DISCUSSION OF TABLE.

It is clearly shown that it was not practicable in this experiment to hold the Jonathan apple in common storage beyond December 1, in 1912, while in storage at 32° it was kept over two and one-half months longer.

Among other things the investigations have shown that 32° is the proper temperature to store most fruits. As is seen in the tables, the fruit held at a temperature of 35° regularly does not keep as well as that at a lower temperature.

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LUTHER BURBANK AND HIS WORK.

By Prof. Chas. A. Shull, Lawrence.

No other horticulturist, perhaps, has been so widely known, either at home or abroad, as has the subject of my address this evening. His name has become almost a household word in America, and for the ingenuity he has displayed, for the patient industry shown in his life work, for the boldness with which he has made use of discovered biological principles, he may well deserve to be considered as representing, or personifying, the genius of American horticulture.

Luther Burbank was born near Lancaster, Mass., March 7, 1849, of English and Scottish ancestry. He was reared on a bleak New England farm, and educated at the Lancaster Academy. His record as a student was not unusual, and after leaving the academy he worked for a time with the Ames Plow Company. This work was too confining for a lad with rather frail constitution, and the openness of the garden and field called him.

At an early age he evinced an interest in the culture of plants and gave hints of the genius of his later years. Before he was out of his teens, for instance, he had devised a means of getting to market with sweet corn a couple of weeks ahead of his neighbors. He accomplished this by sprouting the corn indoors, and having it an inch or so tall by the time the soil was warm enough for planting. This sprouted corn was often through the ground the day after planting, and developed days ahead of neighboring fields.

In the early '70's, when raising potatoes and grapes was a fad in New England, young Burbank found a seed ball of the Early Rose potato in the field; and since potato seed was a rarity, he planted it with some care.

Among the variable offspring was the one bought by Gregory and Son of Marblehead, Mass., which has since become famous as the Burbank potato. This potato, because of its fine shape, size, color, and good keeping and shipping qualities, has been widely grown. It is hard to estimate its value to American agriculture, but some of the popular estimates are gross exaggerations. For instance, in the November, 1912, *Craftsman*, Eloise Roorbach states the value of this potato as $600,000,000, since its origin. This figure was probably obtained by taking a government estimate of the annual production of Burbank potatoes, $17,000,000, and multiplying it by the thirty-five years since the potato was introduced. The absurdity of such a claim is apparent, since a good many years elapsed before it became an important factor in potato production. Moreover, it should be credited with having added only the difference between its value and that of the next best potato, which would have been grown had the Burbank potato never been originated.

Burbank received a trifling sum for this new potato, but it was enough to stimulate his interest in plant breeding, and in 1875 he sought the sunny land of California, an ideal region for a man not overly strong, who wanted to breed new fruits and flowers.

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His principal capital when he arrived at Santa Rosa is said to have been a handful of Burbank potatoes. But more important than these were the perseverance, and industry, and indomitable courage and faith in nature which he brought to his work, a capital which could not fail to yield large returns.

Mr. Burbank is a plain, modest, unassuming man, who believes in his work as he believes in nature and in man. There is a refinement about him which may well be the result of long contact with nature in some of her most beautiful aspects. He is industrious, practical, patient, and skilled, with an interest principally in the size, flavor, and texture of fruits, the fragrance, beauty and usefulness of flowers, the nutritiousness of vegetables and forage plants, rather than in the problems of theoretical biology. He is not a trained scientist; and it is this very fact, perhaps, that gives us Mr. Burbank as he is, a man intensely practical, who cares only for results, not for the interpretation of results. But he possesses a rare judgment of plants, amounting almost to an intuitive recognition of their qualities, which is the outstanding quality in the genius of the man.

The materials which have been used in the Santa Rosa garden have come from the whole wide world. Correspondents in every land have contributed to the success of his efforts by supplying new plants. Special collectors have sought plants in Australia, and South and Central America, to enrich his materials. Similarity of climatic conditions in these localities and Santa Rosa have made such transfers easy. Hundreds of new plants have come in every year for some years, and the number of so-called "creations" which have been produced in Burbank's gardens is now about 1300.

The names of the plants used have not always been preserved, as for instance in the case of the ancestry of the spineless cactus. This loss detracts from the scientific value of his work, but the practical value, of course, is not lessened by the unknown ancestry.

The early work done at Santa Rosa was greatly misunderstood and underestimated by those about him, who expected him to be an average nurseryman. It was hard to understand why a nurseryman should spend time growing plants by the many thousands, only to tear them up and burn them. The neighbors and friends no doubt pitied him for his eccentricity. But by and by, when his patient industry began to yield unheard-of results, the newspapers and magazines sent out reporters and writers who lacked judgment as to scientific values, to feature his work. There has been so much exaggeration, the practical and scientific value of Burbank's work has been so extravagantly overestimated in these magazine encomiums, that it is most difficult for the ordinary individual to make a fair estimate of the worth of the work done at Santa Rosa. A quotation from a magazine article published in 1904 will serve to illustrate the magazine attitude:

"He takes a small, unpalatable fruit, inferior in size and lacking in nutrition, and makes it over into another fruit, large, rich, toothsome, beautiful. A little daisy, small and imperfect, appealed to him one day, and he developed the insignificant flower into one several inches in diameter. He takes a flower with a large, showy bloom, a handsome

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creature among its more delicate companions, but having an offensive odor, and gives it a delicate fragrant scent. He has changed the hue of a yellow poppy into silver, or amethyst, or ruby. He has driven the pit from the plum and filled its place with substances rich, juicy and sweet. He created a walnut with far thinner skin—so thin, indeed, that the hungry birds could perch upon the branches, drive their bills through it and rob the nut of its meat. This would not do, and he reversed the process and bred back until he had a nut of just the right shell thickness. Incidentally, he drove the tannin from the walnut and has left the meat almost as white as snow.

"He has created a white blackberry, large, luscious in flavor, beautiful to look upon. He has made rhubarb yield the entire year round in garden or under glass.

"To a plum which needed richer flavor and flesh he imparted the taste of the Bartlett pear.

"I may not more than mention the sugar prune, five or six times larger than the French prune whence it sprang; the hybrid amaryllis, which now, possessing all its own rare beauty and taking on new attractions, has been increased in size until a single blossom measures ten and one-half inches in diameter; marvelously improved lilies, cannas and gladioli; a new race of clematis; columbines with blooms full three inches in diameter; a chestnut bearing nuts eighteen months after planting from the seed."

And so on almost *ad infinitum*, until the imagination is carried away by the vivid picture and sees the magic wonder-worker with his waving wand, saying, "Presto, change!" able to create anything he pleases from the most commonplace material.

It is my purpose to-night to make as clear as I can the processes by which his results have been obtained, to clear away any mystery which may invest it, and to show what well-known biological principles underlie his work.

Since the number of improved plants is so large, it would be impossible to even catalogue them within the hour. A few of the best-known plants must suffice to bring out the principles and to clear up the sources of the misunderstanding of the public.

One of the most important groups of plants worked upon are the plums. The Burbank plum was obtained as a seedling from the Japanese plum, *Prunus triflora*, the best one being selected for multiplication by budding or grafting. It was named by the pomologist of the Department of Agriculture, and has become deservedly popular because of its fine size, flavor, color, abundant production, and shipping quality. Nothing entered into its production but the planting of seeds and the selection of the best variety obtained.

The Abundance and the Satsuma plums have had a similar origin, but the last-named variety has not given satisfactory results, in my experience.

The Miracle, or stoneless plum, was heralded as a great wonder, but it is a miracle only in name. A long time ago a French prune originated in France, which had a small fruit about the size of a cherry, but had no

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pit about the seed. No one knows just how this sport was produced in Nature's laboratory, but Burbank learned of its existence and secured seeds of it about 1887. This prune was crossed with a wild plum showing a tendency to lose its pit, and later with the larger-sized fruits. After a period of years a plum was secured which had combined the larger size of the cultivated plum with the pitless character of the French prune. The fruit is only medium sized, blue, attractive looking, but insipid. It was introduced to the trade by the Oregon Nursery Company, of Salem, Ore., under the name given above, but there is no miracle about its origin.

This plum has not proved satisfactory, and while plants are still obtainable by those who desire them merely because they are one of Luther Burbank's novelties, the purchase is not recommended.

The Bartlett plum was obtained on crossing a Chinese plum, *Prunus simoni*, with a hybrid of Burbank's production, known as the Delaware plum. The plum was found to have the exact flavor of the Bartlett pear —a result entirely unlooked for. The flavors of fruits are due to the development of chemical compounds known as esters—salts produced by combining alcohols with organic acids. Pear flavor is due to isoamyl acetate, a compound of isoamyl alcohol and acetic acid. Any fruit which develops these two compounds, and combines them in an ester, would taste like pears. So pineapple flavor is methyl butyrate, which suggests the manner of origin of the pineapple quince. In the cross which resulted in the Bartlett plum the new protoplasm produced by the union of two distinct lines was able to develop the same esters as are elaborated in Bartlett pears. No one could have foretold this result, but having once arisen it can be propagated indefinitely and preserved.

The complexity of Burbank's hybridization work was very great in some cases. This may be illustrated by the Alhambra plum, which resulted from a series of crossings in which seven different parents were used. First the Kelsey plum was crossed with the purple-leaved shrub, *Prunus pissardi*, which is used only for ornamental purposes. The resulting hybrid was crossed with the French prune, giving a hybrid with three parents. This trifold hybrid was now crossed with another hybrid, *P. simoni* x *P. triflora;* and then the resulting hybrid with five species in its ancestry was crossed with still another hybrid, *P. americana* x *P. nigra*. Thus seven different species entered into the complex hybrid. This hybrid tree produced seeds, the trees from which exhibited great variability. Some had combined the bad qualities of many ancestors, and were about as poor as plums could be. Others had combined some good and some bad, and were mediocre. The best one obtained was called the Alhambra. It took thirteen years of patient work to bring it into being.

The Plum-cot is a cross from the plum and apricot. This fruit has been obtained in a great variety of colors, and is a very attractive addition to the plum family. It offers but one more example of the combination of characters of two or more ancestors in the offspring.

Among the berries several are worthy of mention. The paradoxical white blackberry was the result of crossing Crystal White as female parent

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with Lawton's blackberry as male parent. From a very large series of the offspring one was chosen which was snowy white in color, and beautifully transparent. It is now known as Iceberg.

The Primus berry is interesting as one of the very few plants originated by Burbank which will come true to seed. It is a cross between *Rubus ursinus*, the western dewberry, and *Rubus crataegifolius*, the Siberian raspberry. It is probably a nonsplitting first generation hybrid, since it comes true to seed. It is a very early ripener, but not of exceptional quality.

The wonderberry has been confused by some. In Hampton's magazine of February, 1911, it is called a cross between a raspberry and the California dewberry. It is evidently confused with the Primus berry. The wonderberry does not belong to the *Rosaceæ*, but to the *Solanum* family, being a cross of a West African species, *Solanum guinense*, and *Solanum villosum*. Neither of the parents have very edible berries, but the cross, which was believed to be true to seed, has a delicious edible berry if allowed to ripen thoroughly.

The berry was sold to John Lewis Childs of Floral Park, N. Y., for introduction, and he made a good-sized fortune from it. The *Rural New Yorker* secured seed from him, and claimed that it was nothing but black nightshade, *Solanum nigrum*, and intimated that the public had been hoaxed by some one.

It must be said that Mr. Burbank has been absolutely honest in his work, and others who know the black nightshade have distinguished the wonderberry from it readily. Its merits as a fruit are debated. In some regions where good fruits are scarce it is rated a valuable addition. Elsewhere, where fine fruits are abundant, it is considered of no value.

The somewhat undignified discussion between the *Rural New Yorker* and other parties concerned probably led the Carnegie Institution to abandon its support of Burbank's work, a result in many ways, it seems to me, regrettable.

Among the flowers may be mentioned the California poppy, *Eschscholtzia californica*. This flower is as common in the meadows of California as our dandelion is with us. One day Burbank's keen eye spied a blossom which showed a tiny streak of red in it. Seed was carefully gathered from this blossom, and among the offspring were found several plants exhibiting the same tendency even in more marked degree. By rigid selection, year after year, the whole flower finally became red, with variations in shade which led by selection to the "ruby" and "amethyst" of the magazine writers. How the original tendency was started by nature is yet a mystery. But the guidance of such tendencies through rigid choice of parentage, a purification process, has been practiced by breeders of plants and animals for a long time.

The beautiful Shasta daisy has been developed by crossing small-flowered native chrysanthemums with a Japanese variety of dazzling whiteness, and with a large-flowered, stiff-stemmed English daisy. The hardiness and profusion of the American ancestors, the whiteness of the Japanese, the size and cutting qualities of the English forms have been recombined, resulting in a great variety of daisies. Dr. de Vries says that the blossoms varied from the size of a button to that of a man's hat.

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Selection of the best plants has yielded a fairly pure strain which is certainly beautiful in California, and it was not inaptly named in honor of California's magnificent snow-crowned mountain.

The various new varieties of fragrant flowers—verbenas, callas, dahlias, etc.— illustrate the keenness of Mr. Burbank's senses. If even a single plant produced a fragrance of unusual quality it did not escape being detected among all the other odors of the garden, and isolated. There is no means yet known whereby nature can be induced to produce fragrance in flowers that lack it; but occasionally such fragrant sports arise, and if preserved and propagated vegetatively can be continued indefinitely. It was in this way that the Fragrance calla, the Arbutus-scented verbena, and the fragrant dahlias originated.

The Australian star flower belongs to the family compositæ, and like other "everlastings" retains its brilliant color in its bracts, after being dried. It also retains its fragrance. Without any crossings, selections were made which increased the size and brilliance of the flower heads, until it was believed that they would serve in the millinery trade for decoration. But they have not so far come into general use, and it is doubtful whether any natural flowers, however beautiful, will displace the grotesque misrepresentations of fruits and flowers which now adorn the feminine headgear.

One of the vegetables which attained some newspaper notoriety for a time is the pomato. This was heralded as a cross between the potato and tomato, and we were promised double cropping with a vengeance. Photographs of the "potato-tomato" were used in one magazine without a single word of explanation in the text; and while this picture had nothing to do with the pomato, it was exceedingly misleading at a time when the newspapers were dealing in pomato stories.

The original plant was a wild Solanum, a potato, from South America, which always bears a small, woolly, tomato-like fruit. Some of the wool has been removed by selection, but it has never been of any value, and it is not a hybrid. It represents what one may call a "philological cross," or a "dictionary hybrid," and the sensation seeking reporters had one more chance for a good story.

The hybrid walnuts have often been mentioned because of their exceptionally rapid growth. The English walnut was crossed with the black walnut, and, as often happens with hybrids, the offspring were more vigorous growers than either parent. Indeed, in this case some of them grew more than twice as fast as the combined growth of both parents. In fifteen years the trees were eighty feet tall, and two feet in diameter. The annual rings in some cases showed a diameter increase of four inches a year. The wood is fine grained and should be useful as cabinet wood.

Such rapidly growing hybrids should prove valuable in reforestation where the climate is suitable, but the labor involved in producing any considerable number of hybrids would be large, since each pollination results in the formation of only one seed. The reasons why mingling two kinds of protoplasm should lead to increased growth are not very clear, but a physiological stimulus to activity has often been noted when two slightly different plasms are commingled.

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This survey would not do justice to Burbank's work without final mention of the spineless cactus which is considered by many his masterpiece. It was to transform the deserts into grazing lands, and to add figuratively a whole new continent to the dominions of mankind. The parentage of the spineless cactus has not been recorded, but some small spineless forms from Central America or Mexico brought in spinelessness, and the giant California *Opuntias* gave the size and form. By many crossings through ten years of time fairly satisfactory recombinations were produced. Care in selection increased the nutritive value and reduced the fiber content, until a tender, nutritious cactus was obtained. The dry substance is said to be one-third to one-half as nutritious as alfalfa.

This achievement was given a hearty recognition. The Carnegie Institution appropriated $10,000 a year for ten years to aid him, and to place on record the methods by which he produced his celebrated novelties. The cactus was introduced into Australia, and we are glad to know that six joints of the cactus brought enough money to build Mr. Burbank a new home in Santa Rosa.

But the new cactus has not been a commercial success. In the first place cattle eat it off too close to the ground if turned in upon it, so that fields must be constantly replanted, a costly operation. In the second place, if the crop must be handled it is too expensive on account of its weight. Some magazine writers have exclaimed over the 100 to 200 tons of food per acre, "food one-third to one-half as nutritious as alfalfa." But they forget that all but a few tons of this tremendous production is just ordinary water and of no nutritive value. The hundred or more tons of cacti have to be handled for the sake of several tons of actual food, and the food is costly as a result of the wasted work. It would not improve the alfalfa of Kansas to swell it up with water till the five tons of hay became a hundred and fifty tons. We would probably dispense with it as a useless crop if we had to handle twenty or thirty tons of water for every ton of dry hay.

The spineless cactus serves as a reserve food when other feed is scarce, but the spiny ones were likewise used as a reserve, by merely singeing off the spines, or by cooking them in their own juice. The chief interest of the new cactus, then, is that it illustrates once more what can be done with plants by hybridization.

Let us turn to consider briefly the secret of Burbank's success as a plant breeder. First of all, his senses are as keen as those of an Indian. His eyes are trained to observe most minutely; his sense of smell enabled him to discover the new fragrant varieties of flowers, and his touch is almost as sensitive with him as in a blind man.

Added to the keenness of his senses is an almost unerring judgment that challenges wonder and admiration. He seems to have an intuitive perception of the inherent qualities of the plants with which he is "on speaking terms." This peculiar quality, which no other breeder has possessed in such a high degree, is probably based on a knowledge of correlations in plants. By careful observations Burbank has learned to associate such qualities as the color of the leaves and branches, the size and shape of the leaves, the texture of the leaf and bark, habits of

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growth, hairiness, or spiny condition, or smoothness, with certain kinds and qualities of fruits. This minute knowledge of correlations has enabled him at every step to make selections swiftly and unerringly, sometimes without waiting to see the fruit.

He is also highly skilled in the technical operations of plant breeding, crossing, budding, grafting, etc., and in the use of these methods has shown great resourcefulness. At one time, for instance, he had over five hundred kinds of apples grafted on a single tree, and in another instance some six hundred varieties of plums. By grafting the seedling twigs onto full-grown trees much time was saved in securing results in cases of complex hybridizations.

The constant advertising he has received at the hands of newspapers and magazines has helped to bring his work to the attention of the masses, but has, on account of its nature, detracted somewhat from the scientific standing of his work. For this, however, Luther Burbank should not be held accountable.

The principal element of his success is seen, therefore, to be his personality, his individuality, his genius for the particular work he does. And this is generally true of any one who wins renown in any field of activity.

We may ask in conclusion what principles of biology are involved in his work? Has he discovered anything new in plant breeding, so far as fundamentals go? We have here a remarkable array—these 1300 new or improved plants! And yet, from a scientific viewpoint, there seems to be not a single new *principle* contributed in the whole forty years of work.

Other breeders long before Burbank's time used all the principles he uses. Not all breeders had his keen senses; not all used such a wealth of materials; not all, if any, had his unerring judgment; not all had his boldness in trying unheard-of combinations; not all possessed his skill in manipulation; not all knew the practical resources he used. And in these things he has been a leader always and everywhere, a genius combining in himself almost all the desirable qualities of a practical horticulturist.

The principles mainly to be emphasized as underlying his work are the following:

(*a*) In every case the materials used or plants possessing the character desired have been found already created in nature by some process which neither Mr. Burbank nor any one else now understands. He has never created a single new character in any plant.

(*b*) Crossing, or hybridization, sometimes highly complex. Several results may follow such crossing; recombination of characters of both parents in a single individual; breaking up of hereditary habits, with greatly increased variability, although this may be merely obscure phases of recombinational variations; and physiological stimulation to growth. Examples have been cited among his productions.

(*c*) Selection of suitable variants in the desired direction. This is one of the very important principles and has been exercised rigidly throughout his work.

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(*d*) Grafting to save time. In case of the Alhambra plum, where seven ancestors entered into the cross, thirteen years were consumed. It would have taken much longer if the young branches had not been grafted onto mature trees and forced to early bloom.

(*e*) Multiplication of vegetative methods. Without this, little of his work would have had permanency. In only a few cases have his improved plants come true to seed, and if propagated by seed now would disappear in almost infinite variations. But when a fruit, or flower, or vegetable, or tree can be grown by budding, graftings, cuttings, splitting tubers, bulbs, etc., any variations can be preserved indefinitely, since all the offspring are in reality pieces of the original plant, necessarily retaining its characters.

No other important principles seem to be seriously involved, and none of these enumerated are new. We need to remember that a large part of Burbank's work was done before the rediscovery of the Mendelian law of heredity, and he has accomplished a great deal without this key to the riddle of inheritance.

We should be careful not to underestimate Burbank's contribution to horticulture. He has shown us on a grand scale that we may boldly make use of the known principles and laws of nature, with absolute confidence that improvements can be made and valuable results achieved. It is worth while for every horticulturist to attempt work for his own locality such as Burbank has done for California. We must not be disappointed at the frequent failure of our own work. Only occasionally is the highest success attained.

No one, in all probability, will ever again be exploited as a plant breeder as Burbank has been. A sane judgment of the value of his work, and the realization that he has made no new contribution to the underlying principles of plant breeding, will serve to check future extravagance in reporting the work of any breeder.

We must not forget Burbank's lack of special training, and his achievements are therefore all the more remarkable. As I said in the beginning, we should pay a tribute of honor to him for his boldness, his ingenuity, his patient and persistent industry, and his intuitive perception and judgment which have made him what I like to call him—the genius of American horticulture.

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THIRD DAY—Morning Session.

The last session of the annual meeting was called to order by Vice President B. F. Smith.

VICE PRESIDENT SMITH: We are going to take up a subject that is near to my heart. I think the strawberry is the best fruit the Almighty ever gave us. You may not know it, many of you, but your humble servant carried the first package of berries in his baggage car (I was then baggage agent on the Illinois Central railroad)—the first package of berries that ever went into Chicago. Many trainloads have been shipped in in the days since gone by, and are being shipped now. It was in 1860, the last of April, that this package was raised, just a little north of Cairo, a famous fruit country there. It was a little box and held about a gallon of berries, the largest package I had seen up to that time, though as a boy in Illinois I had gone out on the prairies and picked wild berries many a time. This southern Illinois country, as many of you have probably noticed on the map of the state, is a kind of a backbone that runs down there for forty miles. You can see smoke from steamboats on the Ohio river on the south and east and Mississippi river on the west. We used to have ripe strawberries there before they had them even south of there. The shipment of berries was begun in 1860. In 1862 or 1863 they began to ship in quantities by express. Those early days they got a dollar a quart for the first berries in Chicago.

BERRIES IN DONIPHAN COUNTY.

By E. V. WAKEMAN, Wathena.

Having all the natural conditions necessary for the production of berries of all kinds, with a soil as deep as the hills are high, affording perfect drainage for both air and water, with nearly 100 miles of river front, giving a climate in which late frosts and severe winterkilling are reduced to a minimum, where severe drouth occurs but once in a quarter of a century, it is small wonder that Doniphan county is to-day the greatest berry-producing section of Kansas.

The early residents, dependent for a while upon the wild berries and other fruits which were so plentiful among the wooded hills and valleys, soon began to plant cultivated varieties of the familiar hardy kinds of berries from which to supply the table with fresh fruit in summer and preserves for winter use. These small garden plantings served to supply those who were fortunate enough to possess them, but left an unfilled demand from city residents.

In 1868 Mr. Frank Kotch, of Troy, planted what was then considered to be quite a large berry patch, from which he supplied the residents of that place with fruit. Mr. Kotch also sold plants over the county from his patches, and soon the local demand was liberally supplied.

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In 1873 W. R. Martin, of Wathena, began shipping wild blackberries, using as containers wooden buckets holding about three gallons each. This was likely the first shipping of berries from the county.

Soon after this John Brazelton, sr., of Wathena, started using quart boxes as shipping containers, buying the berries by the gallon and packing in the quart box.

About 1887 Mr. J. T. Mider, of Wathena, started the industry on a commercial basis by planting a considerable acreage of berries of all kinds, packing the fruit in the Fieldin shipping packages, and shipping by local express to points west along the St. Joseph & Grand Island railroad. A little later other business men of Wathena started to buy and ship berries, and the grower soon supplied this demand to the limit.

Up to this time the industry was carried forward by men having large families to support, who could thus find profitable employment for the younger members; by those living near towns where help was easily obtained, and those with small tracts of land devoted principally to truck gardening. It was during this period that the present small-fruit shipping package was adopted.

After giving other sizes and styles of containers a thorough try-out, the Leslie wine-quart was found to carry the contents to market in much better condition, was of more convenient size, shape and weight, and it is to-day the best all-purpose shipping package for berries. It carries the maximum amount of properly ripened fruit of this kind that can be handled in one package without injury to the fruit.

Growers now realized that the raising of berries was no longer to be considered a side line, but as a profitable industry in itself, and that by growing strawberries, raspberries and blackberries they had about ten weeks of profitable harvest that could be grown upon a small acreage. As a consequence, men of limited means bought a few acres and went into the berry business. Other parts of the county were awakened to the fact that there were opportunities in berries, by the successes at Wathena, and started in the berry business, Troy being next of importance in point of production. Landowners who wished to retire from active farming divided their farms into small tracts and sold or leased on long-term, crop-rent leases.

In 1905 twelve of the leading growers of Wathena organized the Wathena Fruit Growers' Association, which, before the year was up, handled nearly one-half of the fruit produced in the Wathena district.

Thus Wathena was equipped with the best distributors of berries to be had. The industry now grew rapidly and growers started specializing in some one kind of the berries, always with the aim, better fruit and more of it. Troy growers were quick to see the advantage of organization and in 1907 organized a coöperative association at that place, which also met with success. There is no secret to the success of berry growing in Doniphan county.

To begin with, they had the natural advantages of climate, soil, and excellent railroad connections, to which they added industry and thrift.

Growers generally have their fields in good condition the fall before planting by plowing under sod, or green manure crop or a heavy application of stable manure.

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In planting the strawberry, there are various methods used. Some use a line and dibble for setting, others lay the land off with a marker and use a spade. Of late years quite a number of transplanting machines are in use, which generally have good results. The method of setting depends upon the acreage to be planted. Plants are set 16 to 30 inches apart in rows 3 to 4 feet apart, according to condition of plants, land, or varieties being set.

Practically all of the strawberries produced are grown in matted rows, given clean cultivation from planting until after frost, and if plants get too thick in the row late in the fall, a peg-tooth harrow is run over them until they are thinned down to a proper stand, which is about 15 to 20 plants to the foot of row, a row being from 24 to 30 inches wide. Wheat straw, being quite abundant, is the favorite mulch. It is put on any time after the ground is frozen. I have had some experience with spoiled alfalfa hay, with good results.

With the raspberry, the best results in planting are obtained by letting the plants start their new shoots in the patch. Before digging, allow them to grow until some favorable time in May, such as a cloudy or rainy day, when they are taken up and set out at once in furrows, and the tops pinched off. If plants have to be shipped in, or are bunched before the new shoots appear, they are set early—the earlier the better. Cultivation is given as needed to keep the soil in good condition, and should continue until the vines commence to bend low to set tips. Later cultivation is harmful. After the buds begin to swell in the spring, the laterals are cut back to about 10 or 12 inches, leaving a stubby little bush. All old wood should be removed at this time and the trimming burned. Some growers remove the old wood immediately after picking is over, which is undoubtedly a good practice.

Blackberries are best set in the late fall as they make a surer, quicker growth. However, excellent results are obtained by spring setting. Blackberries are set in deeply prepared soil, setting the plants 3 feet apart in rows 8 feet apart. Like the raspberries, blackberries receive good cultivation throughout the summer, but should not be cultivated too late, lest the canes grow tender and winterkill.

Early potatoes or corn is a good crop to grow, the first year, in either raspberries or blackberries; but if potatoes are planted with raspberries, they should be dug early, to avoid injury to the tips of canes, which would come later. The method of after-cultivation is to use a small turning plow in the spring, throwing the soil away from the rows, which are then hoed out, and the centers cultivated level. Just before picking, the plow is again used to throw the soil to the roots of the plants, and the centers again worked down with a cultivator or harrow, cultivating regularly through picking time. There are a host of minor, though important, details about berry growing that must be learned through experience, but so it is with every line of business.

Before picking time arrives the growers secure enough crates to harvest the crop so that there may be no valuable time lost at this important season. Good roomy packing sheds are provided to store empty crates, sufficient for one day's picking, and yet have some room to receive and pack berries.

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The rate of pay for picking is: for strawberries, 30, raspberries 35, blackberries 30 cents per crate; with a 5-cent bonus for those who stay the season through. This practice is necessary as it gives the picker ample remuneration for his labor and tends to insure a more constant service for the grower. Each picker is assigned a row and is made responsible for the clean picking of it, and also for injury to the plants. When the picker brings the berries to the packing shed, his berries are inspected and a check or a ticket for the number of boxes brought in, and a carrier full of empty boxes given him. The carrier in most common use holds 8 boxes and is square, making a convenient size and shape to handle, and carrying all that should be picked at any time. After the berries are received at the packing shed the boxes are carefully leveled, and if there is any difference in the quality of the berries the boxes are put in different crates. Upon delivery at the shipping station the berries are again inspected, and if any are found in bad condition, they are rejected and sold locally.

This method leaves only the best shipping grade to be sent out to distant markets. The distant market is the solution of the distribution problem, and distribution is the main factor in the attainment of satisfactory prices. It is in this that the berry growers are fortunate, for besides the local handlers of fruit, who are all interested in the welfare of the community, the two largest berry-producing centers have associations of the growers themselves, who keep watch of the markets far and near, so that it is an unusual season in which the berries are not sold while they are being picked, or before.

The best idea of the magnitude of the results obtained through these methods may be had from the report of this year's crop.

This year there were produced in Doniphan county 108,863 crates of strawberries, worth $168,737.65; 43,474 crates of raspberries, worth $92,469.10; 53,130 crates of blackberries, worth $87,644.50. Add $2500 worth of berries hauled to St. Joseph by wagon, and you have a grand total of $374,871.25 received for berries. Taking the berries shipped out at 500 crates per car, we get a total of 411 cars, or 16 trainloads, including the amount hauled to St. Joseph. From the Wathena district there were produced 183,717 crates, or 367 cars, or 14 trainloads.

The growth of the industry in the last few years may be indicated by the bank deposits, which in 1905 were $38,000 at the one bank in Wathena. At the last monthly statement of the two banks now doing business at the same place there were $315,000 deposits, mostly in comparatively small accounts.

The business is not a one-man business, but a community industry. Here the farms are small, the owners comfortable, social conditions the best, and the only rivalry is in seeing who can produce the finest berries.

A MEMBER: I would like to ask whether there are any red raspberries produced in that section?

E. V. WAKEMAN: Very few produced. They are mostly sold on the St. Joe market. Our trouble is in the picking. Other raspberries are more profitable. Growing red raspberries is confined mostly to those

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that have a truck trade in St. Joe, and take a half crate of berries at a time and obtain the best prices.

A MEMBER: Is it true that they winterkill?

E. V. WAKEMAN: No, they don't winterkill with us. There is a difference in varieties regarding winterkilling. Moore and Cuthbert go through in good shape.

J. L. PELHAM: I would like to ask Mr. Wakeman if he has had any experience with the Kevitt system, which we heard so much about a few years ago.

E. V. WAKEMAN: No, I don't believe we have.

J. L. PELHAM: I would like to ask if any one present has had any experience with it?

PROFESSOR GREEN: I would like to say that the Yankees grow strawberries by that method; claim they get bigger berries, and where they have a market, as they have, right at their doors, it might pay. I am like the rest of the gentlemen here; I don't believe it will pay in Kansas, where we figure in acres instead of plants.

We, your Committee on Resolutions, beg leave to submit the following:

WHEREAS, The caring for orchards and growing of fruits has made rapid advance in the last few years, and the production of fruit has been largely enhanced in quantity and quality, and,

WHEREAS, Distribution and marketing of fruits is as crude and expensive as it was a century ago, therefore be it

Resolved, That the future efforts of this Society be directed to the formation of an intelligent and economical coöperation by fruit growers, in marketing their products and buying their supplies, thereby increasing the recompense of their labor and cheapening their cost of supplies.

Resolved, That we express our appreciation of the various papers and addresses delivered before this Society, and regard them as an important educational force.

Resolved, That we tender our thanks to the secretary of the Society for the splendid program provided and hope for his speedy return to health.

C. A. BLACKMORE,
EDWIN SNYDER,
Committee.

BLACKBERRIES IN THE ARKANSAS RIVER VALLEY.

By F. E. WICKHAM, Wichita.

In growing blackberries we have adopted the following methods: In selecting a location we prefer a sandy loam soil of good natural fertility. Good drainage is also essential. The blackberry does not require a very rich soil, and for that reason we do not advise manuring. Manuring also has a tendency to cause the plants to burn in dry weather.

In selecting plants the best are none too good and often not good enough. In buying plants we prefer to buy from growers who make a business of growing plants to sell. We usually find that the plant nurseryman has better goods than the general agent or nurseryman who handles all kinds of nursery stock. Another point in favor of buying direct from a plant grower is that we usually get our plants freshly dug and in good condition for planting.

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There are two methods of propagating the blackberry; by root-cutting plants, and by sucker plants. Root-cutting plants are produced by cutting the roots in lengths of two or three inches and planting early in the spring. These cuttings are best made the latter part of November and packed away in moist sandy soil until planting time. Sucker plants are plants that grow from the roots after the plantation is once started.

In buying plants, we prefer root-cutting plants, as we are inclined to believe that growers who propagate from root-cuttings are more careful, and our chance of getting good stock is better than it would be in ordering from a grower who might dig and sell sucker plants from "any old patch."

We like to set our plants as early in the spring as possible. As soon as the soil is in good condition for working we double-disk the ground. For furrowing out the rows, we hitch two horses to a large single-shovel plow and go twice in each row. This makes a much better furrow than an ordinary plow. We do not have the dirt all on one side of the row, and we have the bottom of the furrow well pulverized. We make our rows eight feet part, and set the plants about thirty-four inches apart in the row. We set the plants five to six inches deep and press the soil firmly around each plant with our feet, and finish filling the furrow with the cultivator.

For early berries we plant Kenoyer, and for late, Kittatinny, Blowers and Ward. These varieties are all large, juicy berries, and, as we have a home market, we find them our best sellers. If we were growing berries to ship, we would probably raise the Early Harvest, Snyder, Eldorado, etc.

Blackberries are slow to start, the first season, so we usually cultivate twice and hoe them before they are all up. The first season blackberries make their best growth during the latter part of the summer and fall. This makes it very necessary to keep the cultivator and hoe going the entire growing season. The first year we cultivate close to the plants with a cultivator, and sometimes raise a quick-maturing crop between the rows, such as early potatoes, peas, beans, etc. After the truck crop is harvested we work the middles with a disk. We use a small two-horse disk that is reversible, and can also be regulated in width. In addition, we use a two-horse, double-action, cutaway disk harrow. These two tools we find very useful in the cultivation of many varieties of small fruit.

The second year we change our method a little in cultivating. We avoid the cultivator with sharp pointed shovels, using, instead, the one-horse cultivator equipped with sweeps to work close to the plants, and work the middles with the disk harrow. The idea is to cultivate shallow so as to break as few roots as possible.

The second year we begin to prune. We shorten the laterals on the bearing canes, leaving them twelve to fifteen inches long. This should be done early in the season before the buds start. Later in the season, as the young canes come on, we top them at from three feet to three feet six inches. We like to take out a little more than the terminal bud, as it checks the upward growth and increases the tendency to branch out like a small tree.

A good many authorities advise taking out old canes as soon as the

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crop is harvested. We do not practice this method. We leave the old canes as a protection to the new ones. The old canes are stiff and rigid, making good supports for the new canes, which do not harden until fall. The old canes can be removed in early spring with much less work than in midsummer. In cutting out old canes we use a heavy pair of pruning shears and cut close to the ground.

We have found it a good plan to set a mulberry hedge to the south of our berries. This serves a twofold purpose. First, it furnishes a windbreak, and second, it furnishes berries for the birds at the time our berry crop is ripening.

If I were to ask what was the greatest drawback in growing blackberries, you who have had experience would probably say, the rust. I would say, unfavorable weather. The orange rust is a vital factor in growing the blackberry, and so is the San José scale in growing tree fruits. The San José scale has been made to take a back seat, and the same has been done with the rust. The rust is the great "plague," as it were, of the blackberry. When a plant becomes infected it is beyond a cure. Our hope lies in prevention of infection.

Years ago blackberries were extensively raised in the Arkansas river valley; so many were raised that they were almost a drug on the market. In late years home-grown blackberries are a rarity and their value has more than doubled. What has brought about this condition? The orange rust.

The rust is a disease that permeates the whole system of a plant, root, stem and branch. In a few days after its first appearance spores begin to ripen. These spores are soon distributed over the plantation by various agencies, such as insects, birds, laborers and animals. In a short time the entire plantation is more or less inoculated, and in about three years the rust has a death grip on the plants of the most susceptible varieties. The best remedy we have found is eradication. As soon as growth starts, in the spring, we watch the plants closely. At the first sign of rust we dig the affected plants and burn them, root and branch. Be sure and do it while the rust is in its first stage of development. We can usually recognize the affected plants as soon as the leaves unfold. By following this method we have been very successful in keeping down the rust.

Of picking, packing and marketing we will have little to say. It is the least of our troubles. We pay good wages and insist on good work. Our boxes are well filled and handled carefully. A large part of our crop is sold direct to the consumer at a good price. We do very little delivering, for the buyers come to the farm, taking the berries direct from the packing shed.

We believe there are many places where the blackberry could be grown as a profitable crop. It fits in nicely with other fruit growing, and brings in some ready cash at the time of year when other fruit crops are not maturing. Blackberry growing has its good years and bad years, but if we do our part we should be amply repaid when the good years come.

F. E. WICKHAM: I was in the old rut a good many years. Planted a patch; got all I could off of it, and made money at it. When the rust took it I was out of business until I got another patch. We keep them

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clean; keep the rust out by taking out these affected plants. Out of several acres of blackberries I carried off this year probably twelve or fourteen plants. Last year I got nearer two dozen; but I keep it in check by keeping it clean. The rust doesn't seem to show up in the latter part of the summer.

A MEMBER: Does this orange rust ever affect raspberries?

F. E. WICKHAM: I have not noticed orange rust affecting raspberries.

J. L. PELHAM: He said this year was one of the bad years. If he had plenty of water, did the heat prevent a crop?

F. E. WICKHAM: That is a good question to ask somebody who tried it.

J. L. PELHAM: I don't believe it would have much effect on them. I believe water is the main thing, from what I have observed with my neighbors. Of course, I know it is reasonable to believe that we could n't have as good a crop as in a fair season.

F. E. WICKHAM: I will not say anything about its effect on the berry crop, but I know its effect on the plant crop. I let one of my neighbors have 100 plants last spring. He lives a couple of miles from me, and he has one of these subirrigation sets. He planted those blackberries in rows probably 100 to 175 feet long. They made three rows. In one of the rows the pipe got stopped up and did not take water, and he lost those blackberry plants. In the other two rows the laterals took water; and he was right up there in the wheat country where the wind blew off the wheat stubble, but those backberry plants threw out laterals three feet long. That showed what water will do on plants.

F. W. DIXON: Our plants pulled through without any water and made a good growth.

F. L. KENOYER: Have you ever had any experience with rust getting into a patch all of a sudden; being found all over the patch when you had n't noticed it the year before? The last four years, or possibly five years have been seasons in which the rust has done but little damage in southern Kansas. The climatic conditions have been very favorable. We had it a few years before when in our section, at least, we thought we had our patch perfectly clear of rust. The climatic conditions had been favorable for its development and spores would come in and lie dormant in your patch until conditions got right, then spring up all at once all over the plantation.

F. E. WICKHAM: There are growers that think this rust comes spontaneously. It does n't come "spontaneously" for me. A neighbor's patch all blossomed out with the rust. All you had to do was to touch a plant and the rust spores would fly. Of course, the next year that rust gets started, the wind blows it, perhaps a man catches it on his pants and carries it. The blackberry pickers carry it. Three years ago there was a family wanted to pick blackberries for me. I says, "Are you going to pick blackberries for so and so"? They said, "Yes." "Well, you can't pick blackberries for me."

J. L. PELHAM: I would like to ask one question. On plants now, this winter, if you go into the patch and take up canes, will that rust show up?

F. E. WICKHAM: You will find it in the old hole.

J. L. PELHAM: Where old canes are started in the hole?

F. E. WICKHAM: I have dug most of my blackberry canes in the

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spring. Sometimes I want to dig out an old hill, and find those spores started. Now, I am going to hop into hot water again right here on the question of this rust and pear blight. Enthusiastic men several years ago were going to whip everything with the spray pump, and I am not going to say they can't, but so far they have not been able to eradicate pear blight with a spray pump. The nearest they can get to it is trimming out and burning. With the blackberry it is my opinion the spray pump will do very little good. The rust is down near the root. If you spray it to-day, day after to-morrow one of the shoots comes up, so you have got to go around and spray again.

A. H. GRIESA: One thing that always amuses me is the way that people are trying to discuss spores or fungi; they won't follow them to a conclusion. I have seen blackberry patches on my own and neighbors' places grow to be healthy, thrifty and vigorous. One of my neighbors had a patch on good high prairie, but in the middle of the patch was a little patch of hardpan, and there this rust broke out. Now, do you suppose that rust came from the neighbors? We did n't know of any place for miles around where they had the orange rust. I think it just naturally came there. There are varieties of blackberries more susceptible to rust than others. I have had the Mercereau blackberry. The last four or five years perhaps I have n't gotten a quart of blackberries from them. Last spring I plowed up the last of them, while other varieties in the same row were entirely free from the rust. It was the same soil. The Mercereau was on the upper ground. I find some varieties more susceptible than others to this anthracnose, or rust, on raspberries. The thing that we are interested in most is the apple. The professors and apple growers think the woolly aphis is the worst thing in the world. I will defy any man in the state to plant an apple tree without woolly aphis and keep it clean for five or ten years afterwards. On the other hand, I have an orchard now thirty years old, and now the top of the ground is just knotted with this woolly aphis, and the trees are strong, healthy and thrifty.

ALBERT DICKENS: I did n't know anybody would have anything more to say after that paper on the blackberry. I think he is absolutely right in his remarks concerning that rust, or pear blight. When the rust appears the damage is done. That plant is ruined, practically, and the danger of infection to the others becomes exceedingly great, but this keeping at it eternally as long as a leaf shows it is the proposition that will win. Perhaps Mrs. Smyth can give us more about the life history of that than I can, but control of that disease simply means keeping everlastingly at it.

F. W. DIXON: Mr. Griesa is nearer right than any of them. It is soil and varieties. I have a neighbor who has a blackberry patch that has been there many years, and not a bit of rust on it. Another neighbor near him planted a patch, but after it had been there five years it had plenty of rust; he had to dig it up. Soil is favorable to it in some places. Some varieties are more subject to rust than others. I put out some Early Harvest plants that came from another state, and there was considerable rust. I had to dig some of them up. Two years later there

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was n't any rust in that field. Weather conditions have n't anything to do with rust. We don't know much about it; we are guessing at it.

MRS. B. B. SMYTH: The middle of May I was down in the southern part of the state and drove around quite a little bit in Erie. I found the red rust growing wild in the thickets. It was positively appalling. The foliage was simply completely covered with the dust that had come from the opening spore cases. Of course, if you grub out the stalks that show the leaf before the spore cases open and scatter them, you can get rid of the rust, but if you once let these spores scatter there is no telling how far they will carry, and it simply yellows everything in the neighborhood of the plant. There are some varieties not so susceptible to rust as others. Professor Dickens says when the rust spores appear the damage is done. You have not only lost the stock affected, but you have scattered the spores where they can gain access to other plants.

O. F. WHITNEY: I want to emphasize this matter. Dig the infested plants out early, before that spore sack opens. If you do not do that you just as well not dig them out. I have a patch of Mercereau that the cycle of wet years caused to rust. The last two years we have gained. There is hardly any rust on my Mercereaus; but they must be dug out early in the season, before the sacks have bursted and scattered the spores.

REPORT OF COMMITTEE ON OBITUARIES.

We sorrowfully anounce the loss of the following members during the past year.

GEORGE W. COLLINGS was born in Parke county, Indiana, July 28, 1842; died June 19, 1913, on his farm at Wichita, Kan.

Mr. Collings finished his education at the law school of Ann Arbor, and practiced law in Indiana and Kansas for a great many years. Soon after beginning the practice of law he became interested in his home paper, acquiring an interest in the same, and learning the printer's trade from typesetter to editor.

He moved to Wichita, Kan., in 1883, and after living in the city about twenty years, purchased a farm near the city and retired to rural life.

Mr. Collings was a scholarly man and his private library was among the best in his part of the state. Of a genial disposition, and of democratic tastes, his happiest hours were among his books, his fruits and his flowers, or advising with his fellow men.

Mr. Collings was a writer of more than ordinary ability along sociological and horticultural lines. He was president of the Sedgwick County Horticultural Society for several years, and contributed much to the upbuilding of the society. He became a life member of the Kansas State Horticultural Society in 1902.

E. B. COWGILL was born in Belmont county, Ohio, March 27, 1845. In 1871 he took a claim in Barton county, Kansas, near Great Bend. He was editor of the *Rice County Gazette* from 1875 to 1891, and Professor of Higher Mathematics at the Kansas State Agricultural College from 1885 to 1887. He moved to Topeka in 1891 to become editor of the *Kansas Farmer*, and was its editor until December, 1908.

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As a member of this Society, he was always interested in horticulture as a means to the improvement of the home and family, believing that improved conditions of living must precede any betterment of the race. His paper, the *Kansas Farmer,* always stood for the best in agriculture, and the horticultural interests have lost a worthy friend.

Mr. Cowgill died November 19, 1913.

FRANCIS GOBLE was born in Washington county, Iowa, in 1852, and came to Leavenworth county with his parents when three years old. His parents homesteaded a claim in Salt Creek valley, six miles west of Leavenworth. After reaching his maturity, he taught school for a number of years, but soon purchased the home place, on which he grew a commercial orchard.

Mr. Goble planted and superintended the large orchard of ex-Governor Morrill, situated in the Wallula district, nine miles south of Leavenworth city. He had charge of this orchard for fifteen years, and made it one of the successful orchards of the country. Mr. Goble also managed and purchased other orchards.

He died at Excelsior Springs, Mo., November 25, 1913, aged sixty-one years.

LEWIS FRANKLIN MILLER was born in Salem, N. C., July 14, 1844. When he was seven years of age his father, with the family, moved to Missouri, then to Indiana. He was educated in the Hartsville College. Leaving Indiana he settled in Douglas county, Kansas, and married Era Frances Hilligoss. His permanent home was near Perry, Jefferson county, where his children grew to maturity and where he had an extensive fruit farm. He became a life member of this Society in 1903. He died May 16, 1913, at Pueblo, Colo.

"It is all right; I have not a regret; my life has been full and satisfactory and I am ready to go." With these words THOMAS VOLNEY MUNSON, of Denison, Tex., bade this world "Good night," on the evening of June 21, 1913.

He was born near Astoria, Ill., Sept. 26, 1843, graduated from the University of Kentucky in 1870, and the same year married Miss Ellen Scott Bell, of Lexington, Ky. He became instructor in his Alma Mater for a time, but was forced to an outdoor life by failing health, and became for a time a farmer in eastern Nebraska. He settled at Denison, Tex., in 1876, and there his life work was done.

These are the barest details of a life unique and useful to a remarkable degree. Mr. Munson's position in the world of thought and action is secure as a botanist, a writer and a breeder of grapes. He has been honored by the leading horticultural and scientific societies of this country and Europe, perhaps the greatest distinction being his election as Chevalier du Merite Agricole, in the Legion of Honor. But his greatest work was the giving to the vast Southwest of numerous varieties of good grapes, where none had grown before. In this he was a benefactor as well as scientist. Mr. Munson was a man of a very simple, sweet disposition, helpful to all around him, and while a man of strong views and great moral courage, had very few enemies because of his rare helpful life. When such a man bids the world good-by, he leaves a place that it is next to impossible to fill.

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EDWIN A. POPENOE was born in Centerville, Ohio, July 1, 1853. He came with his parents to Illinois in 1860, where they remained nine years. Upon the removal of his parents to Topeka, in 1869, he entered Washburn College, where he graduated in June, 1876.

Professor Popenoe was elected to the chair of horticulture and entomology at the Kansas State Agricultural College in 1879, where he served until 1907.

As a member of this Society Professor Popenoe had an influence that may not be easily estimated. A man of broad education and high culture, he was interested in every branch of agriculture and influenced for good every phase of horticulture.

As an investigator Professor Popenoe was accurate and thorough. He was a scientist in the true sense of the word, and anything he said or published was accurate and authoritative. In the days when scientific thought was harshly criticised as heresy, and science and theology often clashed, his attitude was often expressed in a favorite text, "Ye shall know the truth, and the truth shall make you free."

As a professor of horticulture he interested many students who have since accomplished much in agricultural science. Professor F. A. Waugh, now head of the Division of Horticulture of the Massachusetts Agricultural College, in dedicating his work on Systematic Pomology to Professor Popenoe, has expressed the thought of many in these words: "One of my teachers, above all others, is responsible for my love of taxonomic science, and, as for that, the same one laid the whole foundation for my love of general horticulture. This man has never received the praise rightly due him for his efforts in behalf of his students, of whom I am but one among hundreds. I know I have been no special credit to him, and like many of the others I have seemed unappreciative. Now, however, as I am about to publish a book, the inspiration for which came long ago from him, I wish to acknowledge my sense of indebtedness to him, and my high personal esteem for Edwin A. Popenoe."

Professor Popenoe died at his home, five miles south of Topeka, November 18, 1913.

CARL RICHTER was born in Saxony, Germany, January 12, 1828. He came to America in 1849, to Kansas in 1854, and to Jefferson county in 1867, where he lived continuously until his death.

Mr. Richter was a fine example of the horticulturist who teaches by example rather than precept. He was a careful planter, a thorough cultivator, a man who cared for his product, and believed in the responsibility of the grower to the consumer. His farm home was a lesson to his neighbors, and his life was a most worthy example.

BERNARD BRYAN SMYTH was born in County Cavan, Ireland, March 8, 1843. He was brought to America when ten years old, living and attending school at Norwalk, Ohio. He enlisted in the Ninth Michigan, May 10, 1861, afterwards serving in the Twenty-third Illinois, and in company A, First U. S. cavalry. He was in the battles of Fredericksburg, Kelly's Ford, Chancellorsville, Beverly's Ford, Manassas Gap, Wilderness, Spottsylvania, Mechanicsville, Cold Harbor, Winchester, Five Forks and Appomattox.

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He came to Kansas in 1874 and settled with his family in Barton county. Professor Smyth was always interested in growing trees, and was for a while engaged with his brother in the active nursery business. He was long a life member of our Society, and its microscopist for the last five years, during which time he has been of material help for the advancement of horticultural interests. He died August 12, 1913.

Respectfully submitted.

CORA WELLHOUSE BULLARD,
ALBERT DICKENS,
W. R. MARTIN,
Committee.

Your committee on exhibits submit the following report:

E. J. Whitaker, Topeka: Five boxes, one each of Winesap, Stayman Winesap, Ben Davis, Missouri Pippin, and Gano. Premium, $5. One plate each of Grimes Golden, Missouri Pippin, York Imperial, Ben Davis, Stayman Winesap, Mammoth Black Twig, Gano, Virginia Beauty, Winesap, and Jonathan. Premium, $5. One plate Winter Banana, western apples.

E. V. Wakeman, Wathena: Two plates each of Mammoth Black Twig and Winesap. Premium, $1.

A. H. Griesa, Lawrence: One plate Douglas pears. Too ripe to judge quality. Shape good. Fine grained and good texture. Premium, $1.

J. B. Wheeler, Oskaloosa: Two plates Winesap. Premium, 50 cents.

T. C. Garst, Wichita: Twelve plates and four varieties, Huntsman Favorite, Mammoth Black Twig, Ben Davis, Winesap. Especially commend the exhibit of Huntsman. Premium, $2.

B. F. Smith, Lawrence: One plate each of Winesap, York Imperial, Ben Davis, and Missouri Pippin. Premium, $2. One plate of seedling pears. Well preserved. As to quality, fine grained, texture good, juicy and sweet, good size, very good. Premium, $1.

B. F. Pancoast, Iola: One plate each of Winesap, Bellflower, Missouri Pippin, Dominie, and Jonathan. Exhibit was commended for having the fall varieties, Bellflower and Dominie. Premium, $3.

O. F. WHITNEY,
MRS. B. B. SMYTH,
Committee.

PRESIDENT TREDWAY: For members of the railroad rate committee I have appointed George O. Green, E. E. Yaggy and W. R. Martin.

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GROWING FRUIT—WHEN TO MARKET.

By E. J. WHITAKER, Topeka.
(Read before Shawnee County Horticultural Society.)

I was asked to tell at what time of year different fruits and vegetables were shipped to our market and when they were most plentiful. I was also asked to say something about apple growing around Topeka. I will present a plan for the small grower where the comforts and pleasures of life will be fairly well mingled with the grind of daily toil.

On the west side of the road one-half mile north of the J. F. Cecil corner are two 40- and one 100-acre tracts facing east along Central Avenue road, and sloping gently to the southwest and northwest. Having purchased these tracts we had the land plowed and sowed to clover. At the proper time we turned the clover under, and now have the soil in fine condition. In surveying we have faced each ten-acre tract on the Central Avenue road. The north thirty acres have been reserved for the superintendent. On each ten-acre tract, facing east and two hundred feet from the road, we propose building a modern bungalow style cottage, suitable in size for the family who will occupy it. At the rear of the house the land slopes gently to the west; chicken houses, beehives, greenhouses, etc., will thus be almost hidden from passersby on the roadway.

The ten acres on the top of the highest knoll has been laid out for a park for Central Boulevard homes. A pagoda summer house in the center of the park will be a gathering place for the families, and, especially in the evening, a place where the men may gather for a social hour. From the roof top one may see the long stretch of hillside beyond the Indian Creek valley, grange hall to the east, Rochester schoolhouse to the west, and the statehouse dome to the south, all beckoning us to daily duties. We have completed setting out the trees and shrubs in the park and the trees in our orchards. Our superintendent is a very capable and experienced man, and will have full charge of our orchards for at least six years.

On the lawn end of each ten-acre tract, where the soil is more sandy, he has planted four acres of Winesap trees, seventy to the acre. On the higher slope toward the house he is planting four acres of Jonathans. These eight acres will be called his commercial orchard by the resident of each ten-acre home. Close to the house is the home orchard, consisting of 1 Early Transparent, 1 Red June, 2 Maiden Blush, 1 Autumn Swaar, 1 Jonathan, 2 Grimes Golden and 1 Northern Spy apples; one each of Alexander, Greensboro, Champion, Elberta, Stump of the World, Old Mixon Free and Heath Cling peaches; also 2 Early Richmond and 2 Montmorency cherries, 1 Wild Goose and 1 Pool's Pride plum, a few gooseberry and currant bushes, and small beds of asparagus and strawberries. This home orchard will supply each resident with fruit for the table and for canning purposes throughout the season. Most residents will keep chickens and bees.

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On the north thirty acres, where we are building the house, barns, etc., for the superintendent, is sufficient rough land which may be utilized as a pasture for cows kept by the superintendent. His wife will make butter and cheese, and also supply the residents with milk, home-made sausage, lard, honey and cider, and from her garden, vegetables, chickens, eggs, etc., to such residents as do not care to produce them themselves. A complete system of water and gas pipes will be laid from the superintendent's plant to each cottage.

Our families must learn to be punctual in their engagements. The auto bus will make regular trips each hour from the homes, and returning will leave the corner of Sixth street and Kansas avenue at half past the hour. This service will start at 6 o'clock each morning, continuing until 8 o'clock in the evening, except Tuesday, Thursday and Sunday evenings, when the trips will be extended until 10 o'clock P. M. The freight auto will carry produce to town as engaged.

Our superintendent visited several orchards in Idaho, Colorado and New Mexico to post himself in up-to-date methods of planting, pruning, cultivating, etc. For our soil and climate he thinks 70 trees to the acre about right, and will cultivate thoroughly the six years of his present contract.

It will readily be seen by our prospective residents the advantage of having the eight-acre commercial orchard taken care of under one system and in charge of one competent man. This will be still more apparent in future years, when the orchards require smudging, spraying, and the crop properly thinned, picked, packed and marketed.

These fourteen 10-acre tracts will be sold on monthly payments of from twenty to twenty-five dollars, according to the size of the house desired built. When the house is occupied an additional charge of five dollars will be made for light, water and care of front lawns furnished by the superintendent. Should misfortune overtake a resident, so he can not meet his payments, such delinquent payments with six per cent interest will be charged to such 10-acre home and deducted from the revenue derived from the eight-acre commercial orchard.

Each resident who has business cares in town will find opportunity to use his surplus energy in caring for his home orchard. Such of our residents as devote all their time to raising fruit and produce will be glad the care of the commercial orchard falls to the superintendent. Suburban home number ten has already been spoken for by a gentleman whose wife wants a greenhouse instead of a chicken house. She is going to raise violets in the winter and start tomato plants for extra early tomatoes. Number ten and several of his neighbors have bought additional land across the road for gardening purposes. He has found that the Californians send their tomatoes to the Kansas market for Thanksgiving and Christmas, the Florida people in February and March, and they come from Texas in April, May and June. Now if he can hurry his plants along he can have a splendid market in June and July. He will transplant out of doors the last of April and use smudge pots to protect from the early May frosts. On this same land he will raise late

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cabbage, using the smudge pots again in November to protect his cabbage for the early winter trade, for he knows the Texas man will ship his cabbage to Kansas in February, March and April, and we have plenty of cheap home-grown cabbage through the summer and fall. He hates to see the Wisconsin man ship his cabbage to Kansas in December and January and get twenty to forty dollars per ton for it.

His next door neighbor, number nine, thinks he has to go to town most every day, being employed at the statehouse. This man does not want to raise chickens, so we will build him a dark cave-like room back of his house where he can raise mushrooms. He has been told it does n't cost much to get started. Throughout the winter and spring months the fancy grocers of Topeka will be glad to pay him forty cents per pound when put up in neat pound boxes, and twenty-five cents for half-pound boxes. It will pay him better to raise a surplus and send them to the Fred Harvey eating houses and to the large hotels at Kansas City. He will not try to carry the beds through the hot weather, but will go out into the open air and see if he can not find some way to force that fine asparagus bed of his ahead of his neighbor's.

At the present time a large share of the canned and bunch asparagus put on the market in February, March and April comes from near the mouth of the Sacramento river, California, a little from Roswell, N. M., and a small amount from Texas. Mr. E. J. Whitaker is now experimenting in raising it in two different kinds of soil near the mouth of the Trinity river in Texas, where the cold of winter and heat of summer are similar to that at the mouth of the Sacramento river. If it can be produced successfully here, year after year, the profits will be large, because of the cheaper rate and shorter time of transportation.

Numbers one and two have been taken by a Rocky Ford, Colo., man. Instead of building two houses for him we agreed to underlay ten acres with six-inch tile about thirty inches apart and put in a cement reservoir and Valk pump. He is going to raise head lettuce and cauliflower in the spring and cucumbers and celery in the fall. It costs a family so much for the head lettuce shipped from Florida in the winter time, and even that shipped in early spring from Texas is expensive. With his experience in Colorado he is sure that by applying a little water just at the right time he can have big solid heads in May and June, which he will never have to sell for less than forty cents per dozen. His experience tells him the market is well supplied with high-priced hot-house cucumbers in early springtime and those from out of doors in June and July, but in the fall, when the housewives want them by the bushel for pickles, etc., the cry is nearly always the same—vines dried up in the summertime.

About this same October the call comes for nice, crisp celery. Weather is hot, and that shipped from Kalamazoo will hardly keep twenty-four hours. It will be better after Thanksgiving, but my Colorado man will have it fresh and crisp every day for a month before Thanksgiving, and all sold by the time real cold weather has arrived, December 20, when California celery is being sent to Kansas in the rough in car lots; and of course Kansas can not compete with early February and March celery from Florida and Texas.

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Your close attention shows me you are interested in what some of my neighbors are going to do with vegetables. Others of you will be more interested in fruit. So far only one man is going to depend on fruit growing, but I think he is starting out right. He said he did not want to work in the winter and wanted to be out of doors all summer, so we were willing to furnish him an auto truck in place of a chicken house. He will work up a retail fruit route, and when Topeka people have looked at a few California strawberries in December, tasted a few sour Texas strawberries in March and April, and got a mouthful of pretty good Arkansas berries in May, they will be ready for his fine ripe Senator Dunlap by June first and finish up his Gandy and Chas. Downing before July first. He knows the hardest time to sell strawberries will be the first and second Mondays in June, so he will make special effort to sell for canning purposes on those two days. He will follow his market with gooseberries, currants, black raspberries, dewberries, blackberries and plums. Now, as you see, by the first of August his rush is over; but he thinks he can get a chance to handle somebody's peach and apple orchard to keep his auto busy until cold weather. You see we are planning to show our neighbors how to raise apples every year and peaches whenever the winter is not colder than 14 degrees below zero.

Let me tell you about our commercial orchards. You wonder why we are planting only Jonathans and Winesaps. The Kansas Jonathans are picked by October first, and at once the consumption begins. We have home-grown grapes in July and August, Michigan in September, and New York in October, California in September and October, Spanish Malaga from November to March; native plums in July, and western plums until October first. Oh so tired of grapes and plums! let us have a good Jonathan apple to eat. Store part of them so we can have them when wanted. Usually store all your Winesaps. We have a few Mexican, a few Texas and a few Arizona oranges before Christmas. Then comes the big rush of California navels—the grower, the commission man and the retailer all push the sale of the navel oranges—and apples take a back seat in January and February; but by March and April we are hungry for apples again. Did you ever see a season you could not sell well-colored and well-packed Winesaps?

In the springtime our Winesap and Jonathan apple trees will be in full blossom, when? Last year April 25, the year before April 1, then April 30, 20, 22, 20, 22, 26, but we had killing frosts April 27, May 1, 3, 10. What shall we do? Mr. Rockefeller has made a nice little oil heater that holds eight quarts of oil and burns nine hours. He says you ought not to use the nice clear oil you use in your lamp. A cheap residuum from refined oil testing 28 to 30 gravity is better for the purpose, and so much cheaper! We ought to have enough heaters to put one near each tree. If it is n't very cold we will light only one-third of them, then if it gets colder we will light some more. Do you think the superintendent is going to light them all himself? No, sir. We will put a big bell near each house, and when we ring the bells you will get up and get your torches and light the heaters. It is generally coldest after two o'clock in the morning, but we will not mind that. We will fill the heaters in

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the daytime. After real warm weather comes the superintendent will put the heaters away in the big barn until the next spring, or lend them to the gardeners to protect tomato plants.

We want to spray the orchards in April with sulphur and lime, and then three or four times after blossoming and after the apples are growing, with Bordeaux mixture. I will tell you what else the residents can do: they can watch and help dig out apple-tree borers in September, and again in April and May.

> "There are no fruit trees, however watched and tended,
> But one big fat borer's there.
> There are no orchards, howe'er defended,
> But show the blighted pear."

When it comes time to pick and box the apples, we will have you and the madam and most of the children working. The superintendent is going out to Washington and Oregon to see how is the best way to do it. They call it the Oregon style. They put nice big apples in the middle of the boxes, just like they put them on the top of the boxes in Missouri and Kansas. If our boys and girls will pick our apples real carefully and we let our wives pack all nice pretty ones in the box we can send them to the Chicago land show and get real rich.

I'll tell you another way in which we'll have a nice time and get rich too. Most everybody in Kansas likes Jonathan apples. Don't it sound funny for me to find fault with Jonathan apple trees. If we had some Jonathan apple trees that would mature their fruit October 1 to 10, instead of September 10 to 20, all the farmers in Kansas would pay us an extra price for our trees. If you will help me we can do it. We want each of you gentlemen to be eyes for us. If you find a Jonathan apple tree anywhere that matures its fruit late, please mark that tree. We will get scions from such trees and will graft them onto our six-year-old Winesap trees. We want scions from several different Jonathan trees, so that four years afterward, when these grafts begin to bear, we can again select the ones maturing their apples after October 1. Another four years will elapse before this last lot of grafts bear, but by that time the type will have become established. Wait eight years? Yes, if fame and fortune come at the end of that time.

The Rambo came from Delaware, the Rome Beauty from Ohio, the Yellow Transparent from Russia, the Northern Spy from New York, why not improved Late Jonathan from Kansas?

Speaking of Northern Spy reminds me of some work to do. Those of you who came from Michigan, Ohio, or New York know what a fine apple for pies the Northern Spy is. It falls before it is ripe in Kansas. When the Northern Spy blossoms in your home orchard I want you to take some paper sacks and tie over each cluster of blossoms to keep the bees away, and when the Winesap blooms a week later mix it into the pollen of the blossoms of the Northern Spy. We will plant the seed. Eight years to wait, but we will have an apple in size between the Northern Spy and Winesap and maturing its fruit later than the Northern Spy in Kansas—an ideal apple for pie in November.

Speaking of apple pie calls to mind a fact, but first I want to remind

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you that the man who can raise an extra quality of vegetables or of fruit need never fear for a good market.

The Orange adorns California
Beneath Winter's somber gray sky;
But, good as it is (shall I warn you?)
The Orange is not fit for pie.

Of course the dear women will tell you
That they can produce Orange pie;
But, pshaw! they are likely to "sell" you
With layer cake three stories high.

The Orange possesses attractions,
But peeling it stimulates wrath;
And when you've reduced it to fractions
You almost require a bath.

Plums, apricots, cherries and peaches,
All please both the palate and eye;
But no other "filling" quite reaches
The goodness of Apples for pie.

The Grape-fruit induces a fellow
To pry out the juice from among
The seeds and a thin skin if yellow
To find himself thoroughly "stung."

The Pineapple offers temptation
Because of its flavor and smell.
And Strawberry shortcake's a ration
Upon whose delights I might dwell.

And Raspberry roll is a winner;
To this we can all testify;
It lends a distinction to dinner,
Yet can not eclipse Apple Pie.

Each luscious fruit giveth a season
Of pleasure to man ere it dies;
But Nature—we care not the reason—
Provides Apples, always, for pies.

Then sing to the Apple forever!
It blesses both feeble and spry.
Let naught, then, our fellowship sever,
Thou joy of my life—Apple Pie!

—*Stephen H. Brown.*

HORTICULTURE AS A VOCATION FOR YOUNG MEN.

By S. B. Hartman.

Horticulture offers many opportunities for the young man who has made himself master of his vocation. I know of no occupation which, at the present time, offers more varied, healthful and remunerative employment than horticulture. Work with trees or plants is necessarily a refining occupation, more so than work with stock; but the work requires patience and energy—it is no vocation for the shiftless, or the young man who is afraid of his hands or clothes. The horticulturist must expect to do some hard work and some disagreeable work, along

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with that which is easy and pleasant, but this is true of all occupations, and if he has a love for the work and a willingness to put his best into it he will reap both pleasure and profit from his chosen vocation.

One feature of horticultural work which appeals to the average young man is its speculative nature. One is dealing with variable objects—plants or trees—no two of which are ever the same or will respond in the same way to the same treatment. Then, too, the weather conditions enter into the varied and speculative nature of the business, and make an amount of uncertainty as to results. This element of speculative uncertainty is just sufficient to keep the average young man interested in the game of horticulture. It does n't get monotonous to him. The laws of mathematics are certain. The same computations with the same figures will always give the same results. There is no variation, no speculation. As a result, mathematicians are said to be narrow, as a class. They deal with certainties and feel that everything should be certain. The horticulturist can not follow set rules and always get the same results. He must rely upon his knowledge of plant life and soil and weather conditions to make his rule variable enough to fit all cases, or to formulate a special rule to fit each case. To the one whose heart is in his work this does much to relieve horticultural work of any monotony, and it also tends to make the horticulturist a broad-minded man.

Another feature which makes horticultural work desirable and pleasant is the quiet beauty which usually surrounds it. The horticulturist is out in the open, surrounded by growing plants, beautiful trees, a balmy, healthful atmosphere, and a sunny sky. He can drink in the beauties of nature to his heart's content. His vision is not limited by four walls and a dingy ceiling, his walls are the horizon and his ceiling the blue sky; he is not forced to breathe the vitiated air of a small factory or office, but draws his supply of oxygen from God's free atmosphere; he need not accustom his nerves to the rattle of pavements or the hum of machinery, but rather to drink in the quiet music of nature, or catch the song of the bird. Certainly the conditions surrounding the horticulturist's work are helpful and restful alike to mind and body.

Still another desirable feature of horticultural work is its variation. The skilled mechanic may stand in a shop day after day, doing nothing but shape a pattern or a casting. This work may require skill, but when this skill is attained there is little more to do except to act as a machine in turning out this part of the factory output. Although the horticulturist may specialize in the production of some one crop he can never escape an almost daily change in his work; in fact, he will more often change several times a day. This is restful, both to body and nerves, and gives the horticulturist the advantage of a wide range of experience, lessens the monotony of the work, and gives both body and mind opportunity for a broader development.

The fruit grower has the advantage of the stock farmer in that he can arrange his work so as to have vacation periods. The dairyman must care for his cows and milk them week days and Sundays, summer and winter. The fruit grower can always find something to do at any season, and is a little extra busy in some seasons, but he can usually

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arrange to have Sundays to himself and to have more or less liberty during the winter season. While stock must be cared for day after day, such work as pruning, manure hauling or making crates can be put off for a season and an occasional vacation enjoyed.

To the young man who is thinking of taking up horticulture I would suggest that he prepare himself as thoroughly as possible for his work. If he has had some practical experience on a farm or with fruit it will be of much assistance to him, but a lack of this experience should not deter him from getting the technical training which an agricultural high school and the Agricultural College can give him. If possible, the horticultural student should complete the four-year course at the College; if this is impossible much can be gained from the short course. Then, if he is not familiar with the practical work on a fruit farm he can spend part of his vacations at this work.

If the young man has no farm to which he can return after his completion of a college course he will find many openings along the line of teaching or professional work or on the farms of others.

The government, with its great department of agriculture, with its divisions and subdivisions, and hundreds of specialists working along definite lines, offers an opening for many trained horticulturists. Foresters, entomologists, pathologists, plant breeders, etc., are wanted continually, both at Washington and throughout the country, and these positions are filled from the young men trained at our agricultural colleges. Several of my classmates have taken up this line of work and attained considerable success in their chosen profession. One whom I recall is investigating and promoting school gardens, another is working to improve the nut industry of the South, another is working on the diseases of citrous fruits in the West, and so on.

Another interesting line of work for the young horticulturist is the experimental work at the various experiment stations in the several states, or in field work taken up under the supervision of our colleges. Several of my acquaintances are in work of this kind.

Many of the trained horticulturists make teaching their occupation, at least for a few years, or until they can start into fruit growing for themselves. The agricultural colleges offer a wide field for this work, and the rural high schools and agricultural courses in village and city high schools are at present making more of a demand for young men competent to engage in this work than the colleges can supply.

Agricultural and horticultural journalism presents another field for the horticulturist who is handy with his pen. Farm and fruit papers and magazines need a large staff of contributors as well as editors, which affords work for horticulturists, some of which can be done in connection with other work on the farm. I recall three classmates of mine who have taken up agricultural journalism, and who now occupy influential positions with leading agricultural journals. One of these clerked in a grocery store for a season after completing his course until a menial position opened up on an eastern agricultural journal. Now he is editor-in-chief of this journal.

But aside from what might be called the professional positions in

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horticulture, there are many lines of horticultural work outside of government or state institutions or horticultural journals, and many of these are demanding the best horticultural talent that can be found, and are offering very remunerative inducements to those who can "deliver the goods." Among these are, (1) landscape architects. Our public parks, cemeteries, and private grounds and estates must be kept up by those skilled in this work. (2) Nurserymen. The trees and plants for our orchards and yards must be grown under the management of those familiar with plant development and plant diseases, which requires the trained nursery specialist. (3) Seedsmen. Our gardeners must be supplied with fresh, healthy seed, the growing and breeding up of which is a business in itself, which requires much knowledge and training. (4) Foresters. Lumbermen and owners of timber tracts need "land lookers" to care for and estimate timber, which is a business requiring a special knowledge and familiarity with the growth and uses of trees. (5) Greenhouse management. The demand for potted and cut flowers has grown to such proportions that a small army of trained workers under glass are needed to furnish the supply. (6) Vegetable forcing. Not only does the trade demand flowers but they must have vegetables, both in and out of season, and the growing of these under glass on a large scale presents a field for the horticulturist trained along this line.

Aside from these and many other lines of horticulture we have the main occupations of fruit growing and vegetable gardening. The latter is being developed so rapidly in the south and about our large markets that there is hardly enough trained help to look after the many problems which it presents. Fruit growing is developing even faster, and there is a continual demand for men capable of taking charge of orchard tracts, fruit farms, or coöperative fruit organizations. These positions offer excellent opportunities for the young man who is made of the right material to take a minor position and work up as fast as he can master the practical work, demonstrate his ability to handle men, and look after the details of the work. When he has done this, if he has saved a part of his salary he is in a position to invest in the business of his employer or in a fruit farm of his own, for after all the ultimate desire of every one is to be independent and to have a business of his own, and there are few vocations that will make one more independent than the ownership of a fruit farm.

I can name a number of my classmates and college friends who went back to the farm, or who have gone back after taking up other work for a few years, and who have made fruit growing a success. I can also name others equally successful who had only a short course at the college, or even none at all, but who, through energy and determination have acquired the necessary knowledge by reading and experience and have become leaders in their chosen vocation. One is a specialist in grape growing; another has gained a reputation in growing fancy strawberries; another has secured a competency from the successful growing of peaches; still others have taken hold of neglected orchards and changed them from a mass of brush to healthy, bearing trees, producing a greater revenue than the entire farm produced under careless management.

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But it is needless to recite further the many openings which present themselves to the trained horticulturist. I think I have cited enough to convince the young man with a liking for the work and the energy to stick by it that he can make no mistake by launching into horticulture; but the young man who is not adapted to the work, who is looking for a snap, or who is too genteel to dig in the dirt, would better look for another occupation.—*Michigan Farmer.*

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ORCHARD.

Farmers' Bulletin No. —

491. Profitable Management of Small Apple Orchard on General Farm.
113. The Apple and How to Grow It.
482. Pear and How to Grow It.
181. Pruning.
401. Protection of Orchards from Spring Frosts.
266. Management of Soils to Conserve Moisture in Semiarid Conditions.
404. Irrigation of Orchards.
278. Leguminous Crops for Green Manuring.

SPRAYING.

492. More Important Enemies of Fruit and Foliage of Apple.
440. Spraying Peaches for Control of Brown Rot, Scab, and Curculio.
127. Important Insecticides, Directions for Their Preparation and Use.
284. Insect and Fungous Enemies of Grape East of Rocky Mountains.
488. Diseases of Cabbage and Related Crops and Their Control.
231. Spraying for Cucumber and Melon Diseases.
91. Potato Diseases and Their Treatment.

GARDEN.

154. Home Fruit Garden, Preparation and Care.
213. Raspberries.
198. Strawberries.
471. Grape Propagation, Pruning, and Training.
255. Home Vegetable Garden.
61. Asparagus Culture.
289. Beans.
254. Cucumbers.
282. Celery.
433. Cabbage.
354. Onion Culture.
434. Home Production of Onion Seed and Sets.
35. Potato Culture.
533. Good Seed Potatoes and How to Produce Them.
324. Sweet Potatoes.
520. Storage and Marketing of Sweet Potatoes.
220. Tomatoes.
204. Cultivation of Mushrooms.
431. Peanuts.
460. Frames as a Factor in Truck Growing.
268. Practical Information for Beginners in Irrigation.
195. Annual Flowering Plants.
157. Propagation of Plants.

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HOME.

521. Canning Tomatoes at Home and in Club Work.
359. Canning Vegetables in the Home.
291. Evaporation of Apples.
203. Canned Fruit, Preserves, and Jellies, Household Methods of Preparation.
256. Preparation of Vegetables for the Table.
175. Home Manufacture and Use of Unfermented Grape Juice.
270. Modern Conveniences for the Farm Home.
185. Beautifying the Home Grounds.
494. Lawn Soils and Lawn.
444. Remedies and Preventives Against Mosquitoes.

SCHOOL.

218. School Garden.
134. Tree Planting on Rural School Grounds.
408. School Exercises in Plant Production.
423. Forest Nurseries for Schools.
428. Testing Farm Seeds in Home and in Rural School.

MISCELLANEOUS.

394. Use of Windmills in Irrigation.
524. Tile Drainage on Farm.
572. System of Farm Cost Accounting.
511. Farm Bookkeeping.
506. Foods of Some Well-known Birds of Forest, Farm and Garden.
188. Weeds used in Medicine.
447. Bees.
442. Treatment of Bee Diseases.
503. Comb-honey.

The following books should be added to the library of the horticulturist and may be purchased from the publishers.

Orange Judd Company, New York—
American Apple Orchard.—Waugh.
American Peach Orchard.—Waugh.
Quince Culture.—Meech.
Small Fruit Culturist.—Fuller.
Systematic Pomology.—Waugh.
Dwarf Fruit Trees.—Waugh.
First Principles of Soil Fertility.—Vivian.
Irrigation Farming.—Wilcox.
Gardening for Profit.—Henderson.
Asparagus.—Hexamer.
Bean Culture.—Severy.
Cabbages, Cauliflower, etc.—Allen.
Celery Culture.—Beattie.
The Potato.—Fraser.
The New Rhubarb Culture.—Morse.
Tomato Culture.—Tracy.
Insects Injurious to Vegetables.—Chittenden.
Home Floriculture.—Rexford.

Macmillan Company, New York—
Principles of Fruit Growing.—Bailey.
Principles of Vegetable Gardening.—Bailey.
Bush Fruits.—Card.
The Soil.—King.
The Fertility of the Land.—Roberts.
Fertilizers.—Voorhees.
Irrigation and Drainage.—King.

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Doubleday, Page & Company, Garden City, N. Y.—
Lawns and How to Make Them.—Barron.
Modern Strawberry Growing.—Wilkinson.
How to Keep Bees.—Comstock.
Crane & Company, Topeka, Kan.—
Plants and Flowers of Kansas.—Smyth.
John Wiley & Sons, New York—
Insect Pests of Farm, Garden, and Orchard.—Sanderson.
American Horticulture Manual.—Budd and Hansen.
J. B. Lippincott, Philadelphia—
Practical Guide to the Wild Flowers and Fruits.—Walton.
Norman W. Henley, 132 Nassau st., New York—
Gasolene Engine on the Farm.—Putnam.
The Fruit Grower, St. Joseph, Mo.—
The Fruit-Grower's Guide Book.—Favor.

The following exchanges are received by the Kansas State Horticultural Society and kept on file at the secretary's office:

California Fruit Grower, San Francisco, Calif.
Colman's Rural World, St. Louis, Mo.
Farmer and Breeder, Sioux City, Iowa.
Farmers Mail and Breeze, Topeka, Kan.
Farmers Review, Chicago, Ill.
Farm and Ranch, Dallas, Texas.
Farm Journal, Philadelphia, Pa.
Fruit and Produce Distributor, Portland, Ore.
Fruit Belt, Grand Rapids, Mich.
Fruit Grower and Farmer, St. Joseph, Mo.
Fruitman and Gardener, Mt. Vernon, Iowa.
Green's Fruit Grower, Rochester, N. Y.
Home and Farm, Louisville, Ky.
Illinois Horticulture, Normal, Ill.
Indiana Farmer, Indianapolis, Ind.
Kansas Farmer, Topeka, Kan.
Market Grower's Journal, Louisville, Ky.
Michigan Farmer, Detroit, Mich.
Nebraska Farmer, Lincoln, Neb.
Nebraska Horticulture, Lincoln, Neb.
Ohio Farmer, Cleveland, Ohio.
Orange Judd Farmer, Springfield, Mass.
Prairie Farmer, Chicago, Ill.
Rural Californian, Los Angeles, Calif.
Rural New Yorker, New York City.
The Earth, Chicago, Ill.
Twentieth Century Farmer, Omaha, Neb.
Wallaces' Farmer, Des Moines, Iowa.
Wisconsin Horticulture, Madison, Wis.

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HORTICULTURAL STATISTICS,
1912 AND 1913.

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STATE SUMMARY.

HORTICULTURAL STATISTICS FOR 1912 AND 1913.

Fruit Trees.		1912.		1913.	
		Bearing.	Not bearing.	Bearing.	Not bearing.
Apple	No.	4,532,801	622,211	4,159,518	642,805
Pear	"	256,578	104,974	290,521	108,532
Peach	"	2,571,199	877,404	2,207,277	445,015
Plum	"	395,315	79,155	364,242	94,755
Cherry	"	490,735	160,396	488,902	207,819
Quince	"	10,720	3,203	9,521	3,944
Apricot	"	149,018	17,892	158,092	27,785
Total	No.	8,405,866	1,865,235	7,678,073	1,530,655
Not bearing	"	1,865,235	.....	1,530,655	.....
Grand total of all fruit trees	No.	9,771,101	.....	9,208,728	.....

Berries and Grapes.		1912.	1913
Strawberries	acres	2,245	3,353
Raspberries	"	1,370	1,505
Blackberries	"	2,364	3,508
Gooseberries	"	364	616
Total	acres	6,343	8,982
Vineyards	"	4,283	4,303
Grand total	acres	10,626	13,285
Vegetable gardens	acres	22,044	25,409

Fruit Grown.		1911.	1912.
Apples	bushels	1,175,494	4,827,789
Pears	"	25,763	160,887
Peaches	"	116,367	644,735
Plums	"	13,593	54,852
Cherries	"	31,243	76,263
Total	bushels	1,362,460	5,764,526
Small Fruits:			
Strawberries	crates	75,133	118,710
Raspberries	"	20,523	34,872
Blackberries	"	42,743	43,764
Gooseberries	"	6,694	12,072
Total	crates	145,093	209,418
Grapes	baskets	296,456	643,462
Total value of fruit		$940,679	$3,028,077
Total value of vegetables		268,400	284,777
Grand total value of all horticultural products		$1,209,079	$3,312,854

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HORTICULTURAL STATISTICS, 1912.

FRUIT TREES OF BEARING AGE, 1912.

COUNTIES.	Apple.	Pear.	Peach.	Plum.	Cherry.	Quince	Apricot.
THE STATE	4,582,301	256,578	2,571,199	395,315	490,735	10,720	149,018
Allen	60,254	3,508	29,293	5,167	3,817	216	382
Anderson	42,600	2,801	23,971	3,956	5,116	208	526
Atchison	43,041	1,174	9,647	847	2,667	15	48
Barber	19,347	1,263	26,885	2,774	3,428	20	2,436
Barton	26,686	2,302	23,410	5,745	6,271	31	1,570
Bourbon	61,547	2,892	23,674	6,120	3,874	172	318
Brown	91,714	4,118	33,248	6,670	8,078	69	342
Butler	79,954	4,848	61,279	6,44	6,904	198	3,655
Chase	31,048	2,094	16,857	1,929	2,302	65	1,169
Chautauqua	31,055	2,795	17,800	5,084	2,138	129	692
Cherokee	53,025	1,008	17,974	4,375	3,181	107	87
Cheyenne	985	200	1,053	4,634	2,988	1	109
Clark	2,435	190	3,728	481	996	14	415
Clay	45,812	1,914	34,065	1,942	4,769	13	1,415
Cloud	39,071	1,074	35,616	2,767	4,797	23	3,361
Coffey	74,848	2,758	29,749	5,117	4,016	189	504
Comanche	2,360	706	7,781	536	2,072	2	364
Cowley	111,267	7,400	61,561	6,397	6,874	369	2,946
Crawford	37,974	2,052	16,433	4,344	2,669	61	188
Decatur	2,578	295	3,281	1,004	4,990	.....	333
Dickinson	56,541	3,970	58,147	3,947	8,115	170	6,340
Doniphan	175,517	10,543	37,380	7,267	7,731	46	400
Douglas	99,293	10,299	38,949	4,477	6,044	358	406
Edwards	7,694	1,167	31,278	6,539	4,031	93	628
Elk	34,907	1,589	17,822	3,619	1,987	97	305
Ellis	1,675	277	1,071	734	1,561	6	216
Ellsworth	15,342	1,202	13,720	1,552	4,579	18	1,114
Finney	5,939	402	2,814	4,482	2,777	2	236
Ford	3,263	723	12,369	2,374	5,698	46	1,384
Franklin	67,899	10,062	31,900	4,491	5,068	195	342
Geary	23,558	1,232	11,701	1,580	3,268	12	379
Gove	906	218	867	4,474	1,225	4	81
Graham	5,978	640	10,757	5,286	5,829	.....	2,703
Grant	43	2	484	444	342	.....	23
Gray	293	27	510	237	322	.....	50
Greeley	.....	.....	.....	.....	.....	.....	.....
Greenwood	59,323	2,594	27,760	7,519	4,083	187	675
Hamilton	966	48	1,408	1,369	670	13	217
Harper	36,133	2,834	29,478	4,746	4,685	102	2,635
Harvey	58,396	3,423	28,248	2,943	4,898	156	5,353
Haskell	27	.....	423	133	294	.....	60
Hodgeman	718	131	1,079	1,161	1,469	7	174
Jackson	115,250	3,978	49,373	16,809	11,836	131	764
Jefferson	149,271	8,053	49,340	5,542	8,928	208	549
Jewell	72,133	2,836	116,193	6,574	13,100	34	7,351
Johnson	67,919	7,272	38,946	6,526	12,363	305	369
Kearny	4,894	56	3,799	5,111	938	19	338
Kingman	35,398	2,808	40,337	4,057	4,014	139	4,125
Kiowa	3,188	577	22,331	2,649	2,569	3	554
Labette	67,492	5,139	30,136	6,042	3,766	463	252
Lane	1,698	188	343	11,657	693	8	28
Leavenworth	194,930	4,581	24,211	2,786	4,325	102	250
Lincoln	23,533	1,111	29,267	1,825	5,377	33	4,438
Linn	71,443	2,995	22,275	5,287	3,942	153	286
Logan	723	92	737	247	666	.....	379

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FRUIT TREES OF BEARING AGE, 1912—CONCLUDED.

COUNTIES.	Apple.	Pear.	Peach.	Plum.	Cherry.	Quince.	Apricot.
Lyon	119,810	7,550	41,235	6,481	7,000	427	1,949
Marion	62,470	3,731	31,264	2,914	8,453	116	11,600
Marshall	93,812	2,569	49,086	3,431	12,002	70	951
McPherson	58,872	3,325	29,700	3,291	7,321	207	12,097
Meade	1,999	337	7,394	908	2,079	2	489
Miami	55,920	3,852	29,757	6,312	6,265	182	314
Mitchell	16,163	1,923	17,623	2,093	2,564	18	1,611
Montgomery	28,828	4,005	25,171	5,650	3,242	195	310
Morris	76,070	2,388	27,020	1,436	3,556	111	1,115
Morton	301	4	509	1,168	121	.....	17
Nemaha	121,721	4,008	54,644	5,097	10,154	529	803
Neosho	60,988	3,677	35,301	7,986	3,580	246	298
Ness	1,398	147	484	2,229	2,343	573	478
Norton	5,937	510	14,378	3,807	7,458	16	2,192
Osage	100,188	5,189	35,748	6,250	7,555	475	1,757
Osborne	16,428	1,591	31,755	1,614	4,652	28	1,191
Ottawa	24,111	1,184	27,311	2,338	4,139	62	1,212
Pawnee	12,047	2,428	12,815	3,413	5,609	63	832
Phillips	14,309	857	32,825	7,794	9,537	41	3,315
Pottawatomie	63,480	2,573	26,279	2,883	5,679	72	724
Pratt	13,153	1,188	42,450	4,256	5,641	24	1,948
Rawlins	1,608	105	1,567	531	2,089	.....	75
Reno	231,509	7,250	84,085	6,238	11,805	168	9,088
Republic	105,971	2,713	72,538	3,875	9,857	85	2,914
Rice	54,452	2,668	38,959	2,544	7,261	99	3,036
Riley	60,931	2,470	21,393	2,790	5,723	53	487
Rooks	11,637	1,015	27,857	3,851	5,889	2	611
Rush	2,981	637	3,270	2,566	2,929	.....	477
Russell	7,853	840	13,430	1,119	4,148	30	705
Saline	25,185	2,469	27,237	2,880	4,582	57	1,415
Scott	547	26	765	2,265	979	.....	249
Sedgwick	132,466	7,558	51,020	5,509	8,144	191	4,541
Seward	30	238	258	29	55	.....	10
Shawnee	111,736	4,620	36,403	3,439	8,620	117	318
Sheridan	905	830	923	1,290	1,455	1	50
Sherman	845	247	1,039	2,991	1,730	5	162
Smith	33,164	705	101,350	4,326	11,282	15	5,190
Stafford	38,202	4,042	49,566	7,903	9,556	107	2,680
Stanton	61	7	1,116	968	361	.....	23
Stevens	87	18	533	3,078	78	.....	39
Sumner	74,331	5,754	41,884	4,792	7,849	188	3,294
Thomas	439	34	513	1,014	1,086	5	53
Trego	1,810	272	1,457	6,698	1,835	.....	264
Wabaunsee	77,953	3,367	26,158	3,315	6,286	231	1,776
Wallace	432	12	700	1,426	198	11	76
Washington	118,600	4,120	54,331	3,041	8,411	47	1,382
Wichita	207	29	1,418	434	788	.....	101
Wilson	56,899	2,757	23,655	5,360	2,500	241	258
Woodson	35,254	1,982	15,448	2,812	2,416	473	243
Wyandotte	83,267	9,856	36,319	6,511	15,288	125	39

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FRUIT TREES *NOT* OF BEARING AGE, 1912.

COUNTIES.	Apple.	Pear.	Peach.	Plum.	Cherry.	Quince.	Apricot.
THE STATE.	622,211	104,974	377,404	79,155	160,896	3,208	17,892
Allen	11,580	1,804	6,806	1,338	2,416	60	75
Anderson	10,532	1,357	6,474	1,090	2,517	37	111
Atchison	3,054	434	1,593	248	642	25	6
Barber	4,300	463	2,569	415	730	16	361
Barton	9,795	891	2,474	851	1,469	28	76
Bourbon	12,836	1,384	5,726	1,593	2,006	27	54
Brown	9,598	874	3,936	737	1,694	91	76
Butler	13,287	1,878	8,216	1,480	2,308	154	619
Chase	3,485	542	1,970	388	882	19	80
Chautauqua	5,581	1,370	3,837	1,024	1,035	26	173
Cherokee	8,518	3,001	7,424	1,245	4,175	63	45
Cheyenne	635	43	430	727	590	.....	2
Clark	469	90	526	100	346	7	99
Clay	6,915	1,093	4,900	817	1,950	21	175
Cloud	4,288	992	2,745	513	1,415	7	62
Coffey	9,925	914	4,941	724	1,692	36	110
Comanche	1,146	212	2,059	108	418	3	101
Cowley	18,014	8,369	8,664	1,291	1,757	85	581
Crawford	5,527	980	5,245	1,557	2,000	28	46
Decatur	1,274	78	2,394	650	896	27	55
Dickinson	10,756	1,792	7,787	1,158	4,056	33	660
Doniphan	7,257	3,567	4,694	724	2,101	10	36
Douglas	11,459	1,418	4,629	533	1,927	35	33
Edwards	2,620	525	880	143	874	35	41
Elk	3,473	2,805	6,086	465	578	100	72
Ellis	277	45	210	169	142	2	45
Ellsworth	3,885	697	3,174	590	1,593	5	335
Finney	569	128	893	600	1,317	.....	39
Ford	1,552	229	2,296	788	1,653	15	125
Franklin	10,559	1,194	4,820	985	1,990	54	47
Geary	2,471	556	2,271	413	968	35	73
Gove	251	45	283	207	270	.....	8
Graham	6,321	5,851	13,311	5,753	5,302	.....	975
Grant	43	.....	93	84	74	5	8
Gray	.....	2	70	.....	10	.....	.....
Greeley	.....	.....	.....	.....	.....	.....	.....
Greenwood	9,760	1,125	6,094	1,180	1,857	62	196
Hamilton	396	44	621	607	384	1	316
Harper	6,923	999	5,369	978	1,653	37	440
Harvey	10,617	1,670	4,786	1,065	2,091	67	488
Haskell	346	22	226	192	58	.. ....	68
Hodgeman	10	.....	220	7	15	.....	.....
Jackson	13,558	1,794	5,428	894	3,144	24	148
Jefferson	15,463	1,919	5,541	718	3,588	27	76
Jewell	7,682	625	3,641	1,144	2,556	6	75
Johnson	9,104	1,376	4,763	1,174	3,524	175	56
Kearny	866	38	1,608	650	503	1	78
Kingman	11,262	997	4,552	758	1,172	21	392
Kiowa	2,485	960	4,680	588	1,512	7	175
Labette	12,072	2,177	12,620	1,530	3,648	84	151
Lane	310	38	89	60	113	.....	1
Leavenworth	3,805	1,000	1,673	283	1,010	13	21
Lincoln	4,589	515	3,098	560	1,316	15	176
Linn	13,117	1,233	5,269	951	1,971	59	74
Logan	324	13	131	40	169	6	30
Lyon	16,849	2,504	10,011	1,479	2,554	248	621
Marion	9,026	1,500	6,517	1,210	3,198	42	1,356
Marshall	9,019	1,517	5,662	880	3,171	17	107
McPherson	10,017	1,305	4,055	1,150	3,098	33	1,779
Meade	1,574	558	2,974	584	1,661	5	192
Miami	16,378	1,815	6,755	1,381	3,042	49	98
Mitchell	2,831	271	1,573	442	605	2	106

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FRUIT TREES *NOT* OF BEARING AGE, 1912.—CONCLUDED.

COUNTIES.	Apple.	Pear.	Peach.	Plum.	Cherry.	Quince.	Apricot.
Montgomery	6,407	6,350	10,266	1,490	1,848	25	128
Morris	4,140	833	2,201	638	746	142	117
Morton	56	15	567	679	234	....	2
Nemaha	9,149	2,000	5,373	1,071	3,377	53	136
Neosho	9,990	1,522	9,117	1,280	2,226	106	140
Ness	510	42	889	546	82	55	22
Norton	1,611	56	1,308	421	1,148	.....	67
Osage	10,547	901	3,018	605	1,299	103	85
Osborne	2,434	406	2,884	219	792	16	59
Ottawa	3,458	612	4,074	680	1,165	5	83
Pawnee	2,995	720	2,597	677	1,156	43	109
Phillips	2,968	161	2,217	490	999	14	239
Pottawatomie	6,782	1,345	5,197	948	2,219	12	147
Pratt	2,586	607	3,765	489	1,587	.....	199
Rawlins	1,988	291	1,189	549	1,290	.....	76
Reno	38,681	1,222	7,120	1,519	3,707	59	420
Republic	6,262	795	3,864	660	1,741	15	90
Rice	9,465	1,189	3,721	892	2,366	56	404
Riley	5,562	1,313	3,558	751	1,934	6	97
Rooks	2,312	150	1,189	488	448	.....	69
Rush	1,221	269	708	355	478	1	82
Russell	2,284	499	2,367	491	1,061	3	94
Saline	6,043	932	5,060	1,421	1,523	10	164
Scott	217	42	195	216	285	1	100
Sedgwick	26,072	1,939	10,475	1,564	3,527	18	537
Seward	578	76	3,560	373	449	.....	236
Shawnee	8,296	681	2,536	585	3,411	34	56
Sheridan	361	44	227	109	121	.....	13
Sherman	366	69	319	1,443	428	18	26
Smith	2,676	344	1,546	157	718	2	60
Stafford	5,998	642	3,993	803	1,980	23	115
Stanton	122	9	271	144	31	3	137
Stevens	15	.....	50	6	10	.....	.....
Sumner	12,523	748	5,527	639	2,169	15	381
Thomas	43	2	80	56	198	.....	20
Trego	299	87	299	910	483	6	21
Wabaunsee	8,094	1,261	3,248	883	1,576	58	163
Wallace	114	6	402	248	80	.....	5
Washington	8,967	1,429	5,373	684	2,223	13	139
Wichita	82	1	403	73	203	2	18
Wilson	10,104	1,168	8,004	1,301	1,782	66	110
Woodson	6,560	785	3,691	761	1,129	74	104
Wyandotte	2,688	1,773	3,629	433	4,411	6	8

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ACREAGE AND PRODUCTS OF SMALL FRUITS.

Product of 1911; acreage of 1912.

COUNTIES.	Strawberries.		Raspberries.		Blackberries.		Gooseberries.	
	Acres. *1912.*	Crates. *1911.*	Acres. *1912.*	Crates. *1911.*	Acres. *1912.*	Crates. *1911.*	Acres. *1912.*	Crates. *1911.*
THE STATE	2,245	75,133	1,370	20,523	2,364	42,743	364	6,694
Allen	17	788	20	2	59	83	19	99
Anderson	9	100	3	48	101	135	2	10
Atchison	27	518	110	138	33	591	1	3
Barber	.....	.....	1	.....	4	1	1	53
Barton	1	40	3	.....	9	6	2	76
Bourbon	39	165	6	170	27	100	2	10
Brown	30	382	2	49	26	139	.....	1
Butler	6	161	11	78	15	119	3	266
Chase	5	27	7	6	8	205	3	13
Chautauqua	9	15	5	.....	59	930	1	4
Cherokee	70	1,798	14	167	31	1,082	5	29
Cheyenne	.....	.....	.....	.....	.....	1	1	127
Clark	10	100	1	.....	2	.....	2	.....
Clay	19	232	5	.....	8	2	1	19
Cloud	2	114	1	221	4	120	1	125
Coffey	18	287	25	8	46	143	3	70
Comanche	.....	.....	.....	.....	.....	.....	3	.....
Cowley	24	360	22	373	59	713	4	62
Crawford	9	170	1	.....	8	10	5	7
Decatur	.....	.....	.....	.....	.....	.....	2	17
Dickinson	74	78	15	14	20	.....	4	10
Doniphan	759	47,727	316	14,798	462	27,777	2	17
Douglas	39	1,114	24	163	37	303	3	70
Edwards	2	.....	.....	.....	1	.....	1	30
Elk	15	382	5	.....	16	90	1	20
Ellis	.....	.....	.....	.....	.....	.....	.....	.....
Ellsworth	.....	17	1	2	1	.....	1	15
Finney	.....	51	.....	.....	.....	.....	1	21
Ford	1	.....	.....	.....	1	1	4	16
Franklin	11	78	6	40	18	255	1	17
Geary	5	149	2	.....	3	109	1	13
Gove	1	.....	.....	.....	.....	.....	1	5
Graham	39	.....	21	.....	28	.....	25	.....
Grant	.....	.....	.....	.....	.....	.....	.....	1
Gray	.....	.....	.....	.....	.....	.....	.....	.....
Greeley	.....	.....	.....	.....	.....	.....	.....	.....
Greenwood	4	73	3	12	40	888	6	50
Hamilton	.....	.....	.....	.....	.....	.....	.....	3
Harper	1	.....	1	1	11	387	1	42
Harvey	17	149	55	59	17	223	10	46
Haskell	.....	.....	.....	.....	.....	.....	.....	.....
Hodgeman	.....	2	.....	.....	.....	.....	.....	26
Jackson	205	1,261	55	216	40	266	13	84
Jefferson	24	397	74	15	31	331	4	25
Jewell	29	38	59	.....	4	.....	8	1,104
Johnson	31	537	25	97	53	341	6	30
Kearny	1	.....	.....	.....	1	30	1	11
Kingman	2	20	14	1	21	132	4	68
Kiowa	.....	.....	1	.....	4	.....	2	135
Labette	88	796	12	80	51	436	3	38
Lane	.....	.....	.....	.....	.....	.....	.....	2
Leavenworth	43	1,282	65	2	53	14	1	84
Lincoln	.....	.....	.....	.....	.....	.....	2	.....
Linn	16	149	5	13	23	247	5	19
Logan	.....	1	.....	.....	.....	.....	.....	.....
Lyon	17	409	3	41	73	231	28	56
Marion	6	65	23	53	8	27	5	35
Marshall	19	162	25	295	9	17	3	99

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ACREAGE AND PRODUCT OF SMALL FRUIT—CONCLUDED.

Product of 1911; acreage of 1912.

COUNTIES.	Strawberries.		Raspberries.		Blackberries.		Gooseberries.	
	Acres. *1912*	Crates. *1911.*	Acres. *1912.*	Crates. *1911.*	Acres. *1912.*	Crates. *1911.*	Acres. *1912.*	Crates. *1911.*
McPherson	3	4	1	.....	87	240	15	102
Meade	3	3	3	.....	4	4	2	40
Miami	13	1,582	8	38	29	615	3	370
Mitchell	.....	.....	.....	.....	.....	.....	6	12
Montgomery	157	3,445	7	644	29	652	1	224
Morris	8	10	4	73	16	35	1	27
Morton	.....	.....	.....	.....	.....	.....	.....	.....
Nemaha	35	665	42	93	46	92	3	60
Neosho	38	2,669	3	45	14	279	15	17
Ness	.....	.....	.....	.....	.....	.....	.....	28
Norton	.....	44	.....	.....	.....	.....	1	1
Osage	10	92	4	6	16	1,869	2	12
Osborne	.....	.....	.....	.....	5	.....	.....	25
Ottawa	3	498	.....	.....	12	71	1	20
Pawnee	.....	8	1	25	1	90	4	312
Phillips	.....	29	.....	.....	28	.....	17	37
Pottawatomie	5	499	13	62	148	90	2	43
Pratt	.....	.....	.....	.....	.....	.....	1	5
Rawlins	.....	9	.....	.....	.....	1	1	3
Reno	8	293	12	7	68	49	2	239
Republic	5	102	1	11	4	10	1	46
Rice	2	24	5	27	8	2	1	87
Riley	13	562	6	37	14	46	5	42
Rooks	1	53	.....	.....	.....	.....	1	5
Rush	.....	12	.....	.....	.....	1	1	14
Russell	.....	.....	.....	.....	.....	.....	1	40
Saline	1	1,201	.....	.....	2	.....	2	301
Scott	.....	.....	.....	.....	.....	10	1	.....
Sedgwick	5	259	26	569	24	204	10	36
Seward	.....	1	.....	.....	.....	.....	6	.....
Shawnee	65	1,255	29	211	24	309	8	133
Sheridan	.....	.....	.....	.....	.....	.....	.....	20
Sherman	.....	4	.....	10	.....	10	1	89
Smith	1	1	.....	.....	.....	.....	1	38
Stafford	10	159	13	45	27	128	6	157
Stanton	.....	.....	.....	.....	.....	.....	.....	.....
Stevens	.....	.....	.....	.....	.....	.....	.....	12
Sumner	7	34	6	47	136	172	1	24
Thomas	.....	3	.....	.....	.....	.....	.....	.....
Trego	.....	.....	.....	.....	.....	.....	.....	1
Wabaunsee	6	158	51	4	9	47	2	122
Wallace	2	.....	.....	6	.....	.....	1	15
Washington	20	159	2	10	8	23	1	85
Wichita	.....	.....	.....	.....	.....	.....	.....	.....
Wilson	27	75	5	4	7	67	5	8
Woodson	5	71	6	17	17	25	12	269
Wyandotte	48	1,021	74	1,875	56	1,347	12	390

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VINEYARDS, GARDENS, FRUIT, VEGETABLES, ETC., 1912.

COUNTIES.	Acres vineyards.	Eight-pound baskets grapes, *1911.*	Acres gardens.	Sales vegetables, *1911.*	Value of all fruit. *1911.*
THE STATE	4,283	296,456	22,044	$886,400	$940,679
Allen	46	2,868	179	$2,108	$15,468
Anderson	82	3,167	338	340	9,501
Atchison	31	3,179	33	1,530	12,098
Barber	25	240	154	2,237	2,492
Barton	42	150	113	678	9,015
Burbon	47	40	32	293	220
Brown	41	3,257	468	710	14,654
Butler	148	4,950	333	1,098	9,875
Chase	22	943	104	175	2,841
Chautauqua	44	1,995	133	1,002	16,385
Cherokee	16	1,706	506	9,750	8,625
Cheyenne	8	.....	62	200	115
Clark	4	75	63	152	70
Clay	45	258	97	470	2,543
Cloud	70	78	147	145	4,592
Coffey	77	4,906	321	656	13,461
Comanche	3	25	60	186	185
Cowley	72	8,241	477	2,850	31,876
Crawford	52	2,054	181	6,044	3,059
Decatur	.....	2	11	76	668
Dickinson	79	1,287	320	1,192	10,904
Donphan	272	68,147	350	530	173,412
Douglas	62	6,802	419	10,115	26,471
Edwards	30	428	39	501	1,296
Elk	19	320	86	603	1,552
Ellis	3	.....	26	30	300
Ellsworth	8	86	67	1,050	2,518
Finney	10	125	65	4,568	6,067
Ford	6	23	92	235	400
Franklin	49	3,839	175	.....	8,742
Geary	51	3,809	227	3,301	8,949
Gove	1	60	40	139	273
Graham	.....	.....	835	9,000	.....
Grant	1	25	6	244	120
Gray	.....	.....	4	.....	225
Greeley	.....	.....	.....	.....	.....
Greenwood	74	1,559	362	798	16,822
Hamilton	1	7	17	183	171
Harper	33	1,049	168	324	2,611
Harvey	46	1,973	333	2,587	5,998
Haskell	.....	.....	10	10	.....
Hodgeman	1	.....	42	232	150
Jackson	96	4,133	326	302	11,552
Jefferson	82	5,488	266	729	26,809
Jewell	25	236	372	338	9,869
Johnson	54	8,974	229	8,200	13,421
Kearny	2	31	19	337	1,538
Kingman	68	3,471	251	795	4,205
Kiowa	6	72	29	184	412
Labette	156	2,066	516	7,448	11,947
Lane	.....	.....	9	260	220
Leavenworth	42	3,274	127	1,807	17,084
Lincoln	14	12	93	572	707
Linn	31	4,032	480	234	5,994
Logan	.....	.....	21	176	505
Lyon	113	7,330	425	4,952	20,371
Marion	96	945	911	2,250	7,393
Marshall	68	2,021	568	736	13,704
McPherson	67	779	257	43	1,662
Meade	6	157	161	203	110

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VINEYARDS, GARDENS, FRUIT, VEGETABLES, ETC., 1912—CONCLUDED.

COUNTIES.	Acres vineyards.	Eight-pound baskets of grapes, *1911.*	Acres gardens.	Sales vegetables, *1911.*	Value of all fruit, *1911.*
Miami	57	4,184	217	$2,917	$19,840
Mitchell	7	50	45	288	2,374
Montgomery	87	4,170	372	8,012	13,885
Morris	37	350	128	722	9,224
Morton	.....	.....	6	5	.....
Nemaha	108	4,990	254	2,452	11,525
Neosho	53	2,504	205	10,792	7,686
Ness	.....	10	16	15	411
Norton	.....	.....	148	2,961	407
Osage	60	4,606	220	570	13,012
Osborne	60	.....	105	191	356
Ottawa	21	276	49	82	1,422
Pawnee	15	125	72	1,613	2,895
Phillips	10	65	236	728	2,295
Pottawatomie	62	6,116	118	1,085	11,743
Pratt	28	333	57	220	3,360
Rawlins	1	2	53	327	281
Reno	158	7,388	694	10,452	44,689
Republic	42	618	243	941	32,728
Rice	29	1,265	146	2,776	1,211
Riley	48	2,006	219	5,845	18,118
Rooks	2	.....	138	270	1,393
Rush	2	5	52	96	876
Russell	36	2	227	850	522
Saline	22	297	252	664	878
Scott	1	.....	18	439	.....
Sedgwick	120	5,181	1,224	39,283	21,066
Seward	1	.....	8	5	.....
Shawnee	94	6,991	640	34,705	32,166
Sheridan	1	.....	21	32	32
Sherman	12	.....	52	2,734	131
Smith	5	109	261	245	2,076
Stafford	100	938	119	2,966	5,342
Stanton	.....	.....	9	.....	.....
Stevens	.....	.....	.....	.....	50
Sumner	35	2,817	438	9,580	17,659
Thomas	12	.....	.....	20	.....
Trego	.....	.....	97	105	119
Wabaunsee	73	5,256	213	236	14,415
Wallace	.....	50	16	135	1,000
Washington	75	3,187	297	303	8,880
Wichita	.....	.....	21	302	.....
Wilson	36	1,002	182	739	7,277
Woodson	29	1,005	300	709	8,126
Wyandotte	246	59,914	1,271	44,030	49,287

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BUSHELS OF FRUIT RAISED IN 1911.

COUNTIES.	Apple.	Pear.	Peach.	Plum.	Cherry.
THE STATE	1,175,494	25,763	116,367	13,593	31,243
Allen	6,053	104	3,712	50	68
Anderson	8,219	169	3,543	105	254
Atchison	14,513	294	182	28	250
Barber	3,691	47	54	149	89
Barton	10,891	64	20	90	490
Bourbon			17		1
Brown	31,231	403	537	206	716
Butler	9,022	216	7,021	88	724
Chase	9,477	116	2,757	31	44
Chautauqua	11,550	386	6,162	223	54
Cherokee	9,830	56	2,630	50	124
Cheyenne	130		54	174	159
Clark	665	7			49
Clay	3,929	146			303
Cloud	11,000	24		41	133
Coffey	20,069	208	8,112	174	192
Comanche	209	8	28	42	18
Cowley	27,754	1,653	9,387	351	292
Crawford	1,987	98	704	61	105
Decatur	896			109	455
Dickinson	18,373	221	21	86	425
Doniphan	99,590	2,995	932	459	1,087
Douglas	31,057	3,350	3,745	105	476
Edwards	462	9	43	249	150
Elk	1,087	70	1,583	29	30
Ellis	208			26	63
Ellsworth	2,805	33	4	19	141
Finney	5,023	11		597	735
Ford	294		8	57	323
Franklin	17,456	66	4,006	41	290
Geary	10,846	178	6	39	206
Gove	34		1	187	43
Graham					
Grant	20		13	35	32
Gray	230				3
Greeley					
Greenwood	8,589	312	9,925	350	132
Hamilton	120		2	59	30
Harper	4,681	162	70	312	611
Harvey	3,775	1,151	14	89	222
Haskell					
Hodgeman	59			98	57
Jackson	18,411	509	797	138	384
Jefferson	46,899	2,395	2,819	89	1,298
Jewell	23,722	173	44	162	420
Johnson	14,781	321	3,143	172	1,048
Kearny	1,449	13	246	444	155
Kingman	4,582	148	104	178	84
Kiowa	218	59	69	246	147
Labette	7,416	613	3,088	136	197
Lane	200			73	57
Leavenworth	101,297	289	1,340	63	159
Lincoln	2,603	14		8	34
Linn	3,708	146	1,388	90	121
Logan	520				7
Lyon	25,664	909	6,694	78	317
Marion	8,418	89	250	37	461
Marshall	19,441	108	6	92	313
McPherson	1,421	20	4	53	93
Meade	1,720	6	83	144	131
Miami	22,327	447	4,753	290	378
Mitchell	4,231	1	2	263	156

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BUSHELS OF FRUIT RAISED IN 1911—CONCLUDED.

COUNTIES.	Apple.	Pear.	Peach.	Plum.	Cherry.
Montgomery	3,753	120	2,969	282	94
Morris	19,337	130	877	18	77
Morton	.....	.....	1	30	.....
Nemaha	19,006	169	236	241	1,474
Neosho	1,864	66	2,572	62	171
Ness	255	12	48	96	20
Norton	1,077	.....	3	136	278
Osage	16,647	206	3,157	26	165
Osborne	1,417	76	.....	3	135
Ottawa	2,309	29	68	48	249
Pawnee	3,712	71	.....	434	341
Phillips	3,018	4	.....	479	320
Pottawatomie	22,312	204	560	65	691
Pratt	4,316	33	28	100	285
Rawlins	425	.....	7	30	66
Reno	111,113	465	133	417	857
Republic	49,742	153	15	108	2,686
Rice	2,821	172	1,274	30	184
Riley	40,231	271	103	98	378
Rooks	1,751	13	.....	257	90
Rush	410	16	4	270	168
Russell	181	3	3	13	58
Saline	3,392	162	3	39	254
Scott	58	.....	.....	12	6
Sedgwick	18,197	814	258	98	746
Seward	.....	.....	.....	.....	.....
Shawnee	37,567	450	1,717	109	1,256
Sheridan	1	.....	.....	65	151
Sherman	104	.....	30	15	58
Smith	5,052	3	.....	87	328
Stafford	9,233	732	102	760	677
Stanton	.....	.....	.....	10	.....
Stevens	.....	.....	.....	.....	.....
Sumner	23,681	305	500	122	372
Thomas	.....	.....	.....	.....	.....
Trego	16	.....	.....	140	83
Wabaunsee	30,144	437	1,929	72	418
Wallace	400	5	.....	106	101
Washington	21,884	172	17	27	365
Wichita	.....	.....	.....	.....	4
Wilson	5,877	188	5,651	114	47
Woodson	3,576	69	3,416	82	107
Wyandotte	20,262	1,406	568	987	2,049

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FORESTRY STATISTICS, 1912.

COUNTIES.	Street trees.	Wild timber.	Cultivated.				
			Walnut.	Locust.	Cottonwood.	Catalpa.	Other varieties.
	Number.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
THE STATE	688,628	370,647	7,483	9,849	14,267	12,781	40,219
Allen	11,184	2,799	50	.....	2	14	547
Anderson	22,626	7,098	474	2	10	469	177
Atchison	650	3,727	252	9	31	72	39
Barber	3,241	5,143	38	396	366	54	475
Barton	47,054	563	20	848	326	72	300
Bourbon	.....	3,031	8	3	.....	7	62
Brown	9,803	6,695	572	15	67	24	216
Butler	11,280	9,185	1	.....	.....	1	3
Chase	2,080	6,351	11	.....	3	15	1
Chautauqua	1,895	7,736	760	6	153	3,015	3,995
Cherokee	3,783	3,404	2	.....	.....	15	33
Cheyenne	1,020	83	29	74	39	2	91
Clark	782	634	49	149	80	4	6
Clay	6,073	3,341	36	3	735	161	389
Cloud	821	3,011	135	3	51	30	428
Coffey	2,806	5,132	11	1	8	71	104
Comanche	1,230	329	27	381	99	36	27
Cowley	3,701	3,865	25	28	38	245	565
Crawford	1,124	191	50	.....	.....	304	174
Decatur	3,375	802	3	47	11	.....	121
Dickinson	9,850	4,715	35	2	65	75	256
Doniphan	4,025	11,749	28	14	21	3	33
Douglas	10,394	6,922	8	2	.....	.....	17
Edwards	3,416	41	14	115	449	25	255
Elk	1,988	3,362	59	.....	13	7	100
Ellis	1,207	368	.....	409	14	.....	85
Ellsworth	7,712	3,541	5	63	39	23	376
Finney	23,353	.....	2	9	41	9	5
Ford	4,172	336	.....	330	515	64	355
Franklin	1,950	11,214	.....	.....	4	.....	.....
Geary	6,137	6,219	10	3	.....	20	129
Gove	1,305	37	9	10	56	4	6
Graham	.....	480	.....	.....	.....	.....	.....
Grant	.....	2	.....	80	3	1	1
Gray	930	50	6	101	167	1	30
Greeley	.....	.....	.....	.....	.....	.....	.....
Greenwood	15,269	12,955	18	15	13	424	89
Hamilton	591	477	.....	7	24	3	5
Harper	12,705	147	23	541	521	550	799
Harvey	8,553	615	165	16	548	68	1,019
Haskell	.....	.....	.....	7	.....	1	.....
Hodgeman	601	743	11	46	6	2	.....
Jackson	7,293	9,715	9	3	2	23	715
Jefferson	5,233	16,174	36	.....	2	26	3,939
Jewell	962	8,307	22	40	51	9	1,035
Johnson	6,218	2,795	152	.....	10	5	.....
Kearny	3,260	7	7	22	7	1	45
Kingman	2,079	30	32	121	851	407	652
Kiowa	23,780	564	1	23	56	128	57
Labette	15,842	4,857	27	.....	.....	28	24
Lane	841	96	2	12	61	2	91
Leavenworth	1,284	9,146	14	.....	7	2	1,108
Lincoln	2,369	2,688	14	110	104	11	197
Linn	7,274	17,039	12	2	.....	6	1
Logan	749	.....	.....	3	1	.....	18
Lyon	10,489	7,297	357	1	115	107	106

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FORESTRY STATISTICS, 1912—CONCLUDED.

COUNTIES.	Street trees.	Wild timber.	Cultivated.				
			Walnut.	Locust.	Cottonwood.	Catalpa.	Other varieties.
	Number.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Marion	24,386	457	226	419	175	954	653
Marshall	13,365	14,909	29	5	39	149	444
McPherson	7,704	2,051	67	11	516	37	1,224
Meade	3,289	71	52	202	209	103	114
Miami	655	4,170	158	.....	.....	815	4
Mitchell	1,826	2,791	6	29	13	6	105
Montgomery	8,782	7,176	12	.....	.....	94	90
Morris	299	4,818	2	3	2	10	104
Morton	20	.....	.....	7	1	3	9
Nemaha	17,089	8,706	820	1,389	54	63	2,544
Neosho	11,784	4,851	112	.....	.....	32	254
Ness	548	469	7	53	93	.....	88
Norton	7,117	1,969	.....	222	6	.....	290
Osage	16,142	4,019	34	.....	4	30	161
Osborne	1,494	3,171	20	55	80	13	204
Ottawa	5,018	1,840	354	3	148	20	189
Pawnee	47,950	826	36	806	417	62	308
Phillips	1,897	4,641	14	28	68	1	227
Pottawatomie	11,842	8,096	842	7	33	11	957
Pratt	190	44	32	85	474	325	927
Rawlins	2,960	619	.....	15	23	.....	107
Reno	7,450	128	103	54	1,217	1,610	2,255
Republic	5,292	5,232	54	44	143	31	2,007
Rice	25,846	421	26	32	504	167	1,008
Riley	11,053	8,365	28	1	9	21	131
Rooks	7,865	2,014	29	248	288	184	563
Rush	3,477	582	170	757	305	19	130
Russell	2,868	1,834	.....	32	36	10	118
Saline	7,348	2,026	86	4	288	63	245
Scott	4,400	.....	6	361	454	514	222
Sedgwick	10,284	1,387	174	172	783	101	533
Seward	135	.....	3	20	13	12	13
Shawnee	10,700	4,582	11	8	2	15	530
Sheridan	205	173	1	6	37	23	46
Sherman	2,942	10	6	16	13	.....	52
Smith	10,342	4,785	48	101	34	53	1,154
Stafford	12,633	67	103	181	860	311	911
Stanton	.....	.....	.....	9	.....	.....	.....
Stevens	.....	.....	1	29	1	2	10
Sumner	4,407	2,309	16	276	933	110	811
Thomas	512	10	.....	22	1	.....	22
Trego	1,989	128	79	8	124	12	104
Wabaunsee	6,857	13,227	33	.....	3	67	103
Wallace	.....	14	5	36	8	.....	4
Washington	7,955	11,143	22	14	62	62	311
Wichita	2,733	.....	.....	5	.....	.....	1
Wilson	4,724	8,445	25	2	9	19	126
Woodson	5,846	6,682	.....	.....	.....	.....	.....
Wyandotte	99	631	.....	.....	.....	1	.....

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HORTICULTURAL STATISTICS, 1913.

FRUIT TREES OF BEARING AGE, 1913.

COUNTIES.	Apple.	Pear.	Peach.	Plum.	Cherry.	Quince.	Apricot.
THE STATE	4,159,518	290,521	2,207,277	364,242	488,902	9,521	158,092
Allen	49,087	3,755	20,460	4,542	3,985	129	285
Anderson	45,240	3,453	22,512	4,231	5,951	120	490
Atchison	98,792	3,387	21,951	3,724	6,417	88	215
Barber	18,408	1,424	26,164	2,861	3,147	19	2,095
Barton	50,354	1,986	12,656	2,605	4,564	111	1,018
Bourbon	51,481	3,102	23,223	6,111	3,466	218	334
Brown	101,122	4,587	31,751	6,058	8,949	87	567
Butler	59,820	4,621	36,862	4,218	5,082	181	3,226
Chase	31,341	2,019	10,565	1,207	2,310	42	984
Chautauqua	23,168	3,365	12,872	4,129	2,078	128	673
Cherokee	61,437	3,755	23,621	5,309	4,569	162	90
Cheyenne	1,392	122	735	3,548	2,445	.....	103
Clark	11,226	262	3,350	676	1,192	23	355
Clay	35,904	1,875	34,939	2,018	4,163	51	1,191
Cloud	38,242	1,735	31,331	2,075	5,273	12	3,346
Coffey	63,133	2,820	22,928	4,381	4,094	115	433
Comanche	3,210	448	5,775	1,017	1,569	7	349
Cowley	74,476	11,109	38,676	5,712	6,691	302	2,600
Crawford	28,278	6,942	15,317	4,744	3,679	95	89
Decatur	3,570	382	6,242	1,643	4,856	.....	292
Dickinson	42,537	5,120	52,625	5,293	10,233	194	5,494
Doniphan	226,537	9,427	34,184	7,150	8,416	35	482
Douglas	78,527	10,394	36,211	4,708	7,181	246	482
Edwards	5,992	1,140	17,322	4,319	3,114	18	532
Elk	32,667	2,294	12,640	4,235	2,415	237	267
Ellis	1,582	270	1,578	1,599	1,514	2	178
Ellsworth	13,340	1,251	10,609	1,302	3,495	36	1,005
Finney	3,409	1,351	2,816	2,816	2,969	5	220
Ford	2,420	620	9,702	1,701	4,129	13	942
Franklin	52,213	4,156	27,236	5,027	5,188	187	411
Geary	17,936	1,163	9,793	1,079	2,605	12	290
Gove	791	189	1,104	2,169	1,038	1	63
Graham	5,088	365	4,769	2,019	3,204	.....	76
Grant	63	4	762	509	423	.....	9
Gray	171	34	479	382	162	6	11
Greeley	57	2	234	399	465	.....	5
Greenwood	42,240	2,597	13,565	2,816	3,640	109	473
Hamilton	378	28	675	1,156	320	.....	155
Harper	33,386	2,939	24,780	4,169	4,472	80	8,441
Harvey	48,407	3,918	25,665	2,840	3,981	166	4,914
Haskell	.....	.....	.....	.....	.....	.....	.....
Hodgeman	423	115	737	412	892	4	154
Jackson	98,889	4,098	41,531	5,108	11,808	68	660
Jefferson	124,321	7,598	42,413	5,134	7,905	137	553
Jewell	66,212	2,781	91,931	4,752	14,409	32	8,690
Johnson	55,409	5,469	30,251	5,998	10,230	162	272
Kearny	4,266	76	4,730	6,514	1,272	5	397
Kingman	33,595	4,869	38,750	4,886	8,906	168	3,398
Kiowa	2,809	506	14,620	1,375	2,468	142	413
Labette	47,782	7,756	28,886	5,984	4,435	379	577
Lane	916	166	258	1,895	635	4	18
Leavenworth	171,951	6,921	28,867	3,820	5,624	114	196
Lincoln	21,799	1,395	29,476	2,383	5,396	54	3,454
Linn	57,447	8,438	21,338	5,801	4,626	98	237
Logan	591	23	359	98	480	34	231

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FRUIT TREES OF BEARING AGE.—CONCLUDED.

COUNTIES:	Apple.	Pear.	Peach.	Plum.	Cherry.	Quince.	Apricot.
Lyon	108,941	7,085	28,052	5,129	5,392	315	1,530
Marion	51,289	4,826	28,356	2,815	8,478	31	10,711
Marshall	75,058	3,106	37,155	3,068	7,708	24	978
McPherson	42,763	3,617	23,927	2,859	6,488	130	9,496
Meade	1,780	245	9,652	674	2,326	12	629
Miami	74,819	5,070	29,610	5,680	8,218	119	264
Mitchell	15,910	589	15,735	1,279	2,739	9	1,618
Montgomery	22,963	6,159	25,180	5,538	4,248	164	424
Morris	55,163	2,249	24,839	1,505	4,016	52	8,242
Morton	291	458	478	1,109	282	.....	21
Nemaha	100,442	3,742	47,207	8,567	10,084	34	1,062
Neosho	51,868	3,835	28,487	6,780	5,190	180	244
Ness	2,237	394	976	4,555	2,815	593	1,625
Norton	8,289	785	21,771	2,360	11,698	30	4,989
Osage	70,178	3,928	24,202	3,709	5,933	269	902
Osborne	17,192	2,615	35,060	2,372	5,509	324	1,655
Ottawa	21,960	1,430	24,156	2,491	4,473	19	1,400
Pawnee	8,525	1,887	8,501	2,129	3,303	35	581
Phillips	16,129	805	32,212	10,757	8,010	7	4,621
Pottawatomie	54,294	2,527	22,893	3,013	5,503	29	641
Pratt	10,784	1,156	33,062	3,689	5,181	22	1,915
Rawlins	1,785	137	1,824	605	2,383	.....	112
Reno	224,358	11,118	75,528	9,946	11,277	233	9,986
Republic	102,459	2,682	57,766	3,916	8,529	16	2,954
Rice	42,356	2,562	26,064	2,367	5,893	128	2,467
Riley	43,687	2,606	14,483	2,804	5,654	11	592
Rooks	10,078	744	23,991	3,734	4,598	16	623
Rush	2,863	657	2,510	2,549	2,836	3	1,109
Russell	6,701	828	11,976	1,554	3,407	11	731
Saline	24,291	2,169	29,369	4,045	5,546	29	2,208
Scott	434	46	4,558	1,898	617	.....	281
Sedgwick	127,753	11,289	40,689	5,513	7,583	419	3,036
Seward	238	12	1,806	1,088	205	.....	150
Shawnee	122,473	5,603	36,158	5,006	13,064	120	431
Sheridan	1,494	314	1,970	1,261	1,815	14	70
Sherman	1,433	167	934	3,177	2,110	3	115
Smith	33,427	768	99,954	4,211	10,197	27	7,483
Stafford	35,421	4,358	40,924	5,536	6,782	44	2,570
Stanton	169	2	809	471	328	.....	15
Stevens	131	4	1,701	158	301	.....	18
Sumner	68,979	7,753	32,410	6,100	8,031	227	3,456
Thomas	318	116	582	1,729	1,388	.....	45
Trego	497	73	233	2,705	406	.....	139
Wabaunsee	62,806	3,647	21,720	3,329	6,369	180	1,635
Wallace	511	15	821	4,456	317	.....	105
Washington	89,706	9,149	42,161	7,930	7,155	494	1,134
Wichita	182	32	1,005	498	532	.....	116
Wilson	39,638	2,970	18,933	4,119	2,741	186	209
Woodson	30,526	1,797	11,443	3,539	2,781	174	275
Wyandotte	135,150	9,823	41,168	9,216	20,945	155	44

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FRUIT TREES *NOT* OF BEARING AGE, 1913.

COUNTIES.	Apple.	P ar.	Peach.	Plum.	Cherry.	Quince.	Apricot.
THE STATE	642,805	108,532	445,015	94,755	207,819	3,944	27,785
Allen	11,240	2,001	7,150	1,669	2,878	35	56
Anderson	10,200	1,655	6,836	1,081	3,868	57	164
Atchison	10,876	1,475	5,137	852	3,293	46	83
Barber	5,320	1,052	5,317	1,134	1,511	20	598
Barton	4,574	972	2,665	1,189	2,460	12	622
Bourbon	14,075	1,381	5,989	1,533	1,937	31	73
Brown	15,467	1,569	5,217	1,251	2,807	40	125
Butler	10,227	1,621	8,925	1,593	2,914	43	633
Chase	3,793	782	3,276	489	1,155	7	161
Chautauqua	5,194	1,168	5,147	1,007	1,285	37	386
Cherokee	13,070	2,122	12,059	2,191	8,100	381	82
Cheyenne	491	44	471	901	407	.....	25
Clark	805	298	1,237	240	592	7	90
Clay	6,462	1,386	5,606	847	2,148	.....	247
Cloud	5,393	984	3,771	809	1,878	12	328
Coffey	8,559	1,017	5,168	936	2,148	39	137
Comanche	1,878	573	2,116	326	749	10	147
Cowley	20,330	3,181	11,822	2,022	3,868	116	878
Crawford	6,268	1,026	4,696	1,623	2,295	15	64
Decatur	614	79	839	272	720	5	35
Dickinson	14,084	2,757	11,908	2,193	6,474	76	1,026
Doniphan	9,999	4,445	5,174	934	2,790	14	119
Douglas	10,361	1,758	7,632	944	3,897	38	97
Edwards	956	294	843	291	495	.....	40
Elk	5,883	4,592	13,320	1,871	1,560	31	121
Ellis	346	70	243	398	272	.....	52
Ellsworth	3,811	677	3,014	576	1,314	88	184
Finney	523	108	904	753	985	40	24
Ford	1,172	358	2,273	764	1,628	7	196
Franklin	14,941	1,521	7,927	1,246	2,759	58	121
Geary	3,041	634	2,158	481	1,669	3	202
Gove	492	62	756	856	388	.....	24
Graham	594	.....	.....	.....	.....	.....	.....
Grant	15	2	200	88	96	.....	8
Gray	6	.....	156	17	42	.....	5
Greeley	253	2	103	76	91	.....	.....
Greenwood	7,454	940	5,603	693	1,822	65	172
Hamilton	112	17	359	403	200	6	519
Harper	7,241	1,416	5,667	1,120	2,011	46	753
Harvey	10,162	1,696	4,830	1,106	2,537	59	601
Haskell	.....	.....	.....	.....	.....	.....	.....
Hodgeman	123	23	392	161	181	.....	30
Jackson	15,875	1,855	6,292	1,184	3,898	98	68
Jefferson	10,330	1,166	3,497	663	3,532	30	66
Jewell	8,584	774	5,783	1,273	3,307	22	581
Johnson	9,325	1,360	5,287	1,616	3,982	119	90
Kearny	569	53	2,238	802	540	1	100
Kingman	9,461	1,127	5,587	645	1,527	66	450
Kiowa	1,989	423	4,109	413	1,358	7	130
Labette	12,468	2,538	16,731	2,695	5,285	146	334
Lane	157	1	95	43	39	.....	7
Leavenworth	5,746	1,398	1,792	462	2,011	8	40
Lincoln	4,696	687	3,177	657	1,384	4	179
Linn	13,460	1,397	6,633	1,248	3,582	76	128
Logan	281	26	81	219	58	3	16
Lyon	12,725	2,809	8,762	3,186	2,948	133	316
Marion	10,364	1,818	7,122	1,370	4,969	157	1,592
Marshall	7,842	1,855	5,803	993	3,309	9	127
McPherson	8,791	1,408	4,472	1,225	3,132	85	974
Meade	1,227	257	3,613	359	1,284	37	284
Miami	13,173	1,622	7,555	1,256	3,554	92	81
Mitchell	2,042	203	1,260	277	825	6	87

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FRUIT TREES *NOT* OF BEARING AGE, 1913—CONCLUDED.

COUNTIES.	Apple.	Pear.	Peach.	Plum	Cherry.	Quince.	Apricot.
Montgomery	8,125	4,736	14,589	2,162	4,084	71	312
Morris	7,081	1,332	3,005	557	1,395	48	225
Morton	212	22	525	101	90	.....	71
Nemaha	15,884	2,510	8,005	1,541	4,305	67	196
Neosho	12,004	1,819	9,989	1,660	2,766	96	192
Ness	580	282	592	233	189	10	15
Norton	3,825	514	4,889	1,332	3,613	.....	3,021
Osage	9,881	1,296	7,198	1,132	2,360	89	196
Osborne	2,624	446	2,555	444	726	20	62
Ottawa	4,334	864	3,872	926	1,685	3	205
Pawnee	2,610	672	2,399	453	1,184	9	60
Phillips	3,110	136	2,277	1,270	1,421	41	278
Pottawatomie	7,715	1,468	4,529	1,014	2,959	20	163
Pratt	2,256	692	3,414	485	1,987	41	459
Rawlins	2,211	316	1,354	609	1,263	.....	63
Reno	32,007	1,903	11,351	1,290	5,769	120	3,023
Republic	6,160	1,036	5,365	967	2,013	15	1s2
Rice	10,053	1,417	5,778	1,343	3,182	61	627
Riley	6,137	1,321	4,374	894	2,842	9	177
Rooks	1,765	132	2,266	377	707	4	35
Rush	1,127	346	811	302	525	42	29
Russell	1,431	303	1,463	325	628	7	44
Saline	7,300	1,461	5,330	1,278	3,473	13	315
Scott	332	33	819	301	322	1	90
Sedgwick	24,189	2,827	10,316	1,593	3,789	60	677
Seward	198	42	1,029	386	117	.....	38
Shawnee	10,376	1,448	5,783	696	4,309	44	102
Sheridan	376	57	227	98	211	20	7
Sherman	314	21	322	358	534	.....	17
Smith	3,240	188	4,063	532	1,460	.....	174
Stafford	5,404	537	3,392	466	1,811	20	146
Stanton	7	1	8	65	70	.....	12
Stevens	90	6	1,618	93	45	.....	77
Sumner	12,068	1,783	8,968	1,608	3,303	81	791
Thomas	90	23	136	97	166	.....	7
Trego	382	75	476	522	375	.....	17
Wabaunsee	6,665	1,424	3,753	924	2,177	213	296
Wallace	120	8	128	391	185	.....	33
Washington	9,080	2,339	5,370	820	2,505	68	129
Wichita	33	3	289	133	106	.....	4
Wilson	8,745	1,424	7,692	1,287	2,309	52	235
Woodson	8,605	1,152	6,216	1,187	2,231	56	146
Wyandotte	8,544	1,672	2,790	4,956	3,930	.....	4

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ACREAGE AND PRODUCTS OF SMALL FRUITS.

Products, 1912; acreage, 1913.

COUNTIES.	Strawberries.		Raspberries.		Blackberries.		Gooseberries.	
	Acres. 1913.	Crates. 1912.	Acres. 1913.	Crates. 1912.	Acres. 1913.	Crates. 1912.	Acres. 1913.	Crates. 1912.
THE STATE	3,353	118,710	1,505	34,872	3,508	43,764	616	12,072
Allen	15	542	3	76	103	207	7	399
Anderson	17	436	6	75	29	76	25	242
Atchison	176	3,391	115	843	150	1,862	2	65
Barber	.....	21	.....	2	76	12	4	822
Barton	1	31	.....	.....	1	30	4	771
Bourbon	49	1,564	9	.....	36	.....	2	.....
Brown	13	488	6	115	22	24	1	6
Butler	7	124	3	17	6	90	9	187
Chase	8	18	7	12	18	19	5	118
Chautauqua	4	12	9	8	23	117	4	126
Cherokee	69	6,274	24	609	257	2,948	10	124
Cheyenne	1	10	.....	18	.....	.....	3	23
Clark	.....	9	.....	.....	1	.....	6	35
Clay	119	353	5	8	1	23	1	31
Cloud	10	251	1	15	4	471	.....	38
Coffey	61	662	9	306	9	143	2	40
Comanche	1	2	2	6	3	.....	1	2
Cowley	33	197	12	35	46	461	6	162
Crawford	35	747	8	127	16	1,059	6	890
Decatur	1	19	.....	4	.....	1	1	31
Dickinson	35	669	18	311	72	161	15	402
Doniphan	1,119	75,828	488	24,220	644	29,142	3	155
Douglas	52	3,180	23	392	34	261	7	144
Edwards	.....	100	2	60	1	200	1	6
Elk	20	2,233	1	56	28	132	6	39
Ellis	.....	30	12	.....	.....	.....	.....	.....
Ellsworth	.....	15	.....	18	.....	4	1	53
Finney	.....	2	.....	30	.....	.....	1	1
Ford	13	43	.....	.....	1	2	2	5
Franklin	51	386	44	315	69	66	6	66
Geary	6	159	1	41	3	2	1	28
Gove	3	.....	.....	1	.....	.....	.....	1
Graham	.....	.....	.....	.....	.....	.....	.....	.....
Grant	.....	.....	.....	.....	.....	25	.....	.....
Gray	.....	20	1	50	.....	25	.....	.....
Greeley	.....	.....	.....	.....	.....	.....	.....	5
Greenwood	4	411	14	55	14	199	3	231
Hamilton	1	.....	.....	.....	.....	.....	.....	1
Harper	3	1	3	11	16	15	4	5
Harvey	5	262	4	64	6	11	3	138
Haskell	.....	.....	.....	.....	.....	.....	.....	.....
Hodgeman	.....	.....	.....	.....	.....	.....	.....	3
Jackson	252	1,534	6	389	23	139	2	204
Jefferson	38	749	14	55	27	36	6	36
Jewell	4	321	2	12	3	83	7	87
Johnson	68	1,609	47	641	170	116	7	256
Kearny	1	.....	.....	.....	.....	.....	1	11
Kingman	3	9	6	170	71	74	43	18
Kiowa	.....	.....	.....	.....	1	.....	2	17
Labette	85	1,435	18	60	49	259	8	256
Lane	.....	10	.....	.....	.....	.....	.....	3
Leavenworth	57	1,739	37	914	18	361	2	1
Lincoln	.....	.....	.....	.....	.....	.....	1	31
Linn	8	362	2	29	16	28	12	299
Logan	5	.....	.....	.....	.....	.....	.....	12
Lyon	30	85	34	23	36	286	17	159
Marion	73	126	25	65	449	104	46	218
Marshall	14	771	9	126	6	620	12	165

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ACREAGE AND PRODUCTS OF SMALL FRUITS—CONCLUDED.

Product, 1912; acreage, 1913.

COUNTIES.	Strawberries.		Raspberries.		Blackberries.		Gooseberries.	
	Acres. *1913.*	Crates. *1912.*	Acres. *1913.*	Crates. *1912.*	Acres. *1913.*	Crates. *1912.*	Acres. *1913.*	Crates. *1912.*
McPherson	27	19	6	62	5	479	4	407
Meade	.....	69	5	26	.....	32	3	53
Miami	26	396	15	117	29	24	11	233
Mitchell	.....	39	.....	.....	2	.....	2	5
Montgomery	49	490	61	29	25	180	6	75
Morris	2	99	1	57	2	52	2	32
Morton	.....	.....	.....	.....	.....	.....	.....	1
Nemaha	50	986	27	122	25	53	4	154
Neosho	38	1,449	4	174	26	415	7	473
Ness	.....	.....	.....	.....	40	.....	.....	.....
Norton	1	2	.....	.....	.....	.....	23	.....
Osage	19	207	5	95	275	30	3	26
Osborne	.....	33	.....	10	.....	4	.....	3
Ottawa	11	118	5	18	11	46	2	182
Pawnee	4	.....	.....	1	3	1	1	42
Phillips	2	203	.....	12	6	1	2	32
Pottawatomie	13	338	34	77	12	45	4	19
Pratt	216	15	.....	13	82	137	3	14
Rawlins	.....	.....	.....	13	1	14	1	24
Reno	18	225	2	84	29	55	6	287
Republic	3	169	1	75	2	10	4	83
Rice	11	127	23	81	23	71	66	383
Riley	16	227	3	209	5	65	3	87
Rooks	.....	1	.....	11	.....	.....	3	34
Rush	.....	9	.....	.....	.....	4	.....	39
Russell	.....	30	.....	.....	.....	.....	6	344
Saline	2	20	1	22	2	28	.....	147
Scott	.....	.....	3	.....	.....	.....	1	48
Sedgwick	14	235	11	80	41	457	5	274
Seward	.....	.....	.....	3	1	3	.....	.....
Shawnee	80	799	77	639	40	40	36	90
Sheridan	3	.....	.....	.....	.....	.....	.....	17
Sherman	3	31	.....	10	24	.....	2	78
Smith	2	42	.....	18	.....	6	4	122
Stafford	50	614	31	156	43	60	5	82
Stanton	.....	16	.....	.....	.....	.....	.....	.....
Stevens	.....	.....	.....	.....	.....	.....	.....	.....
Sumner	20	125	3	56	27	280	3	112
Thomas	.....	3	.....	.....	.....	.....	.....	.....
Trego	.....	20	.....	.....	.....	.....	.....	.....
Wabaunsee	6	379	4	131	10	52	3	111
Wallace	.....	.....	.....	.....	1	.....	1	48
Washington	15	979	82	230	7	61	2	261
Wichita	.....	1	.....	.....	.....	.....	.....	2
Wilson	9	108	1	40	23	126	7	22
Woodson	16	238	6	123	34	103	12	133
Wyandotte	52	2,659	64	1,708	94	936	51	330

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VINEYARDS, GARDENS, FRUIT, VEGETABLES, ETC., 1913.

COUNTIES.	Acres vineyards.	Eight-pound baskets of grapes, *1912.*	Acres vegetable garden.	Value of garden products. *1912.*	Value of all fruit, *1912.*
THE STATE	4,303	643,462	25,409	$284,777	$3,028,067
Allen	55	4,509	475	$3,608	$19,941
Anderson	51	6,722	1,247	1,307	20,225
Atchison	152	12,925	301	6,032	52,042
Barber	66	1,233	170	2,761	17,954
Barton	10	616	145	2,255	20,443
Bourbon	43	.....	.....	.....	.....
Brown	50	5,539	277	1,331	45,724
Butler	53	6,743	369	778	19,690
Chase	14	3,493	123	532	16,751
Chautauqua	47	9,632	288	881	7,688
Cherokee	51	3,133	552	11,930	26,207
Cheyenne	13	805	57	575	1,221
Clark	2	345	76	689	1,445
Clay	38	6,604	110	2,258	22,124
Cloud	24	2,812	169	870	18,044
Coffey	70	6,140	310	1,053	16,736
Comanche	38	267	111	1,187	5,520
Cowley	58	7,497	611	3,422	45,862
Crawford	38	4,032	101	900	9,123
Decatur	2	122	79	554	3,828
Dickinson	99	8,024	401	2,336	37,292
Doniphan	301	110,490	353	446	353,305
Douglas	75	9,112	407	9,078	65,026
Edwards	10	835	50	325	2,599
Elk	35	1,041	590	2,092	10,142
Ellis	4	439	21	45	568
Ellsworth	12	954	168	1,323	5,347
Finney	5	1,776	188	4,231	4,697
Ford	35	569	103	1,655	563
Franklin	48	10,321	316	3,251	26,195
Geary	43	5,271	88	446	52,082
Gove	3	67	69	919	649
Graham	.....	.....	188	.....	1,278
Grant	.....	56	2	225	.....
Gray	.....	.....	.....	2	270
Greeley	.....	.....	14	60	.....
Greenwood	26	2,124	229	1,332	15,339
Hamilton	1	8	13	92	171
Harper	42	11,069	171	897	14,323
Harvey	75	7,254	391	2,559	28,549
Haskell	.....	.....	.....	.....	.....
Hodgeman	2	17	10	230	311
Jackson	81	6,553	415	1,578	47,176
Jefferson	91	14,966	314	4,966	56,090
Jewell	17	2,308	182	684	21,306
Johnson	109	10,512	544	14,801	38,467
Kearny	3	261	65	683	4,562
Kingman	60	7,827	260	1,627	21,126
Kiowa	8	727	28	238	3,560
Labette	41	4,758	509	9,823	24,120
Lane	2	6	28	97	702
Leavenworth	57	5,898	297	6,721	728,746
Lincoln	9	1,284	63	1,080	17,202
Linn	34	5,123	260	656	29,235
Logan	.....	10	41	240	1,022
Lyon	116	12,862	414	4,496	31,012
Marion	108	6,326	256	2,601	22,254
Marshall	74	5,420	553	796	36,802
McPherson	81	1,808	386	845	27,070
Meade	3	200	142	313	2,492

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VIVEYARDS, GARDENS, FRUITS, VEGETABLES, ETC., 1913—CONCLUDED.

COUNTIES.	Acres vine-yards.	Eight-pound baskets of grapes, *1912.*	Acres vegetable garden.	Value of garden prod cts, *1912.*	Value of all fruit, *1912.*
Miami	62	7,215	279	$348	$27,[illegible]55
Mitchell	9	1,948	117	1,914	8,684
Montgomery	82	11,285	342	6,949	9,922
Morris	47	3,693	125	414	13,643
Morton	.....	103	4	20	42
Nemaha	103	15,672	396	457	55,277
Neosho	77	2,396	622	2,492	14,244
Ness	1	12	36	482	688
Norton	3	4	263	8,625	13,690
Osage	93	8,833	1,176	3,401	19,782
Osborne	69	85	265	504	8,511
Ottawa	32	3,478	108	1,106	19,699
Pawnee	4	353	80	1,144	3,906
Phillips	5	416	385	1,113	11,208
Pottawatomie	73	9,552	250	1,667	27,864
Pratt	32	1,152	124	687	10,368
Rawlins	1	15	96	415	585
Reno	106	35,850	799	21,975	165,248
Republic	45	5,913	236	2,557	26,416
Rice	32	5,617	118	2,994	20,452
Riley	40	5,765	283	7,492	31,069
Rooks	14	101	121	1,426	5,856
Rush	5	63	80	367	923
Russell	2	254	118	361	3,778
Saline	34	9,352	124	1,536	28,860
Scott	1	.....	27	678	260
Sedgwick	104	18,987	1,726	30,797	62,746
Seward	1	.....	26	7	109
Shawnee	86	10,455	191	12,816	43,225
Sheridan	2	.....	24	396	1,652
Sherman	1	68	67	1,282	476
Smith	7	859	334	1,549	24,449
Stafford	45	3,874	101	2,111	19,234
Stanton	3	51	1	10	107
Stevens	.....	.....	1	69	10
Sumner	31	5,863	496	5,905	45,462
Thomas	.....	14	55	456	169
Trego	.....	40	23	195	147
Wabaunsee	54	6,260	84	191	18,995
Wallace	1	20	30	1,518	1,763
Washington	79	8,297	329	355	30,912
Wichita	.....	.....	18	82	66
Wilson	29	1,441	261	1,164	6,305
Woodson	30	781	325	605	12,502
Wyandotte	273	117,880	640	27,484	128,810

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BUSHELS OF FRUIT GROWN IN 1912.

COUNTIES.	Apples.	Pears.	Peaches.	Plums.	Cherries.
THE STATE	4,827,789	160,887	644,735	54,852	76,263
Allen	40,522	2,672	1,273	748	499
Anderson	44,346	3,094	699	423	587
Atchison	279,138	4,656	2,458	962	2,199
Barber	13,220	621	12,639	864	217
Barton	13,748	17	3,224	356	119
Bourbon					
Brown	248,124	3,104	6,968	974	2,161
Butler	35,122	1,898	15,953	420	483
Chase	32,325	740	6,138	178	238
Chautauqua	5,081	958	4,546	357	201
Cherokee	25,073	630	4,575	440	291
Cheyenne	270	6	33	396	150
Clark	1,258	158	1,745	81	104
Clay	51,073	943	11,399	151	375
Cloud	37,257	385	9,920	320	585
Coffey	47,090	1,877	3,084	620	279
Comanche	3,183	200	3,544	145	128
Cowley	45,900	3,291	24,782	699	700
Crawford	16,394	1,360	3,971	471	207
Decatur	3,595	17	525	271	534
Dickinson	43,457	2,661	22,382	894	2,090
Doniphan	554,755	5,831	396	1,685	2,260
Douglas	154,520	13,122	1,773	1,299	2,285
Edwards	866	109	1,439	303	160
Elk	5,564	833	3,734	495	94
Ellis	214	10	133	111	29
Ellsworth	6,718	227	2,281	29	176
Finney	2,114	174	638	374	425
Ford	100	94	386	59	110
Franklin	45,523	2,639	1,382	535	600
Geary	22,800	393	5,537	351	383
Gove	254	13	133	67	17
Graham			1,186	225	
Grant	15		42	15	25
Gray	130		43	100	1
Greeley			12	29	6
Greenwood	26,739	1,177	5,455	359	341
Hamilton	11	2	115	10	9
Harper	16,115	1,123	10,334	396	441
Harvey	45,880	3,262	12,599	546	590
Haskell					
Hodgeman	56	15	146	11	29
Jackson	116,168	2,754	10,225	618	1,701
Jefferson	165,985	5,870	4,261	837	2,530
Jewell	29,140	700	14,269	879	1,146
Johnson	99,927	4,178	317	1,432	3,464
Kearny	1,832	10	1,994	721	131
Kingman	30,959	1,989	20,193	2,081	204
Kiowa	835	115	3,466	131	182
Labette	10,171	9,386	9,129	786	475
Lane	505	2	40	78	26
Leavenworth	377,354	4,741	131	434	752
Lincoln	26,330	443	8,913	287	313
Linn	66,877	2,298	133	333	348
Logan	934	26	61	10	12
Lyon	56,234	4,319	9,555	350	574
Marion	32,698	1,892	10,909	367	1,160
Marshall	82,967	1,187	7,347	328	1,112
McPherson	41,866	2,090	8,917	746	1,478
Meade	1,178	39	3,104	107	113
Miami	110,130	5,345	344	1,130	980
Mitchell	9,999	338	6,722	154	99

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BUSHELS OF FRUIT GROWN IN 1912—CONCLUDED.

COUNTIES.	Apples.	Pears.	Peaches.	Plums.	Cherries.
Montgomery	3,862	1,028	10,859	791	416
Morris	43,788	602	3,870	84	288
Morton	6	.....	9	8	1
Nemaha	204,485	1,960	21,204	940	2,696
Neosho	4,843	1,160	5,076	282	553
Ness	715	10	196	79	68
Norton	5,665	110	3,142	170	847
Osage	42,594	2,324	4,550	439	899
Osborne	10,977	655	21,028	310	248
Ottawa	31,457	778	9,874	620	475
Pawnee	2,323	763	2,576	187	200
Phillips	10,175	233	5,762	1,152	559
Pottawatomie	62,559	1,603	12,576	502	956
Pratt	4,124	152	13,709	367	325
Rawlins	545	.....	13	14	232
Reno	294,636	6,527	41,479	1,502	1,044
Republic	65,665	1,052	13,543	414	757
Rice	32,748	1,675	11,787	637	293
Riley	57,820	924	11,085	646	923
Rooks	3,481	275	3,387	516	558
Rush	277	79	313	114	55
Russell	3,920	168	2,485	160	218
Saline	25,197	2,013	14,122	740	599
Scott	55	.....	186	101	9
Sedgwick	132,131	6,343	30,920	1,811	1,182
Seward	.....	6	179	25	7
Shawnee	127,006	2,302	12,366	1,041	2,618
Sheridan	1,495	11	156	78	95
Sherman	252	1	19	161	104
Smith	25,908	202	17,343	665	778
Stafford	13,469	2,630	19,938	806	468
Stanton	.....	.....	273	69	58
Stevens	.....	.....	44	.....	3
Sumner	56,619	3,495	16,782	1,082	692
Thomas	1	.....	33	83	25
Trego	36	.....	16	20	17
Wabaunsee	62,959	3,049	8,940	521	6,034
Wallace	919	15	269	379	37
Washington	100,769	1,407	11,588	263	903
Wichita	.....	.....	17	4	1
Wilson	5,460	881	2,200	182	140
Woodson	31,117	952	3,000	235	200
Wyandotte	227,097	9,018	224	7,634	12,769

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RANK OF COUNTIES, 1913.

Counties.	Bearing fruit trees.							Acres of small fruits.			
	Apples.	Pears.	Peaches.	Plums.	Cherries.	Quince.	Apricot.	Straw-berries.	Rasp-berries.	Black-berries.	Grapes.
Allen	35	29	56	31	56	28	67	27	27	7	28
Anderson	38	33	51	36	28	30	53	25	24	.....	31
Atchison	12	35	52	47	26	38	77	4	2	6	3
Barber	60	57	37	57	66	58	23	.....	.....	10	23
Barton	34	51	65	64	47	34	35	40	.....	43	54
Bourbon	32	38	48	9	62	13	64	16	21	20	36
Brown	10	22	25	11	11	39	50	29	24	29	32
Butler	25	21	16	37	42	17	16	34	27	38	30
Chase	52	50	70	88	80	46	37	33	23	30	50
Chautauqua	56	36	64	40	82	29	42	37	21	28	34
Cherokee	24	29	47	19	46	23	90	9	14	4	31
Cheyenne	87	86	96	50	76	.....	89	40	.....	.....	51
Clark	66	80	80	94	88	56	62	.....	.....	43	61
Clay	46	53	20	75	52	44	31	5	25	43	40
Cloud	45	55	26	73	38	63	15	31	29	40	48
Coffey	22	41	49	33	54	32	56	11	21	36	21
Comanche	77	73	76	93	84	66	63	40	28	41	40
Cowley	18	3	14	14	24	7	19	17	19	15	26
Crawford	54	12	60	28	59	36	91	18	22	31	40
Decatur	75	75	75	80	43	.....	65	40	.....	.....	61
Dickinson	41	17	5	20	7	48	8	18	18	11	10
Doniphan	1	6	21	6	14	14	54	1	1	1	1
Douglas	15	4	17	29	21	9	54	13	15	21	18
Edwards	72	62	58	34	67	59	52	.....	28	43	53
Elk	51	49	66	35	77	10	71	22	29	23	41
Ellis	84	79	87	81	85	71	80	.....	19	.....	59
Ellsworth	65	59	69	85	61	47	36	.....	.....	.....	52
Finney	76	77	81	56	68	68	76	.....	.....	.....	58
Ford	80	69	72	79	53	62	39	29	.....	43	41
Franklin	30	24	36	24	40	15	60	14	8	13	33
Geary	61	60	71	92	74	63	66	35	29	41	36
Gove	89	82	88	71	89	72	94	38	.....	.....	60
Graham	73	76	77	74	65	.....	92	.....	.....	.....	....
Grant	103	98	94	97	96	.....	102	.....	.....	.....	....
Gray	100	92	99	102	104	67	101	.....	29	.....	....
Greeley	104	99	103	101	95	.....	103	.....	.....	.....	....
Greenwood	43	46	63	60	60	35	55	37	18	32	47
Hamilton	95	94	97	89	99	.....	81	40	.....	.....	62
Harper	50	40	42	39	49	40	5	38	27	31	37
Harvey	36	27	39	59	57	21	10	36	26	38	18
Haskell	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hodgeman	94	88	95	100	90	69	82	.....	.....	.....	61
Jackson	13	25	9	23	4	41	43	2	24	28	15
Jefferson	6	8	7	21	18	26	51	17	18	24	12
Jewell	21	42	2	27	2	50	4	37	28	31	49
Johnson	27	15	27	11	8	23	70	10	7	5	5
Kearny	74	89	78	8	87	68	61	40	.....	.....	60
Kingman	48	19	13	26	58	20	14	38	24	12	25
Kiowa	79	71	61	84	75	25	59	.....	.....	43	56
Labette	37	9	33	12	50	4	49	6	16	14	38
Lane	88	84	102	77	91	69	99	.....	.....	.....	61
Leavenworth	3	13	31	45	32	33	79	12	9	30	27
Lincoln	59	58	29	67	37	42	13	.....	.....	.....	55
Linn	26	34	54	13	44	37	74	33	28	31	42
Logan	90	95	101	104	94	49	75	36	.....	.....	....
Lyon	8	11	35	22	36	6	29	19	10	20	4
Marion	33	20	32	61	13	51	1	8	13	2	6
Marshall	16	37	15	54	19	55	38	28	21	38	19
McPherson	40	32	46	58	25	27	3	20	24	39	15
Meade	83	81	78	95	79	63	45	.....	25	.....	60

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RANK OF COUNTIES, 1913—CONCLUDED.

COUNTIES.	Bearing fruit trees.							Acreage of small fruits.			
	Apples.	Pears.	Peaches.	Plums.	Cherries.	Quince.	Apricot.	Straw-berries.	Rasp-berries.	Black-berries.	Grapes.
Miami	17	18	28	15	15	31	72	21	17	22	24
Mitchell	64	70	59	86	73	65	28	.....	.....	42	55
Montgomery	57	14	40	16	51	22	58	16	6	26	14
Morris	28	50	41	83	55	43	6	39	29	42	34
Morton	97	72	100	90	102	.....	97	.....	.....	.....	....
Nemaha	11	30	6	4	10	49	34	15	12	26	9
Neosho	31	28	32	7	39	18	73	17	26	25	17
Ness	81	74	90	80	70	1	27	.....	.....	18	62
Norton	70	65	53	70	5	52	9	40	.....	.....	60
Osage	19	26	43	48	29	8	40	23	25	3	11
Osborne	62	44	19	68	34	5	25	.....	.....	.....	22
Ottawa	58	56	44	66	48	58	30	30	25	34	48
Pawnee	69	52	74	72	64	48	48	37	.....	41	59
Phillips	63	64	24	1	17	66	11	39	.....	38	58
Pottawatomie	29	48	50	55	35	53	44	29	10	33	20
Pratt	67	61	22	49	41	57	24	3	.....	9	43
Rawlins	82	85	84	96	78	.....	87	.....	.....	43	62
Reno	2	2	3	2	6	11	2	24	28	22	7
Republic	9	43	4	44	12	60	18	38	29	42	35
Rice	42	47	38	69	30	29	21	30	15	28	43
Riley	39	45	62	62	31	64	47	26	27	39	39
Rooks	68	67	45	46	45	60	46	.....	.....	.....	50
Rush	78	68	82	65	69	70	33	.....	.....	.....	58
Russell	71	63	67	82	63	64	41	.....	.....	.....	61
Saline	55	49	30	42	33	53	22	39	29	42	42
Scott	93	91	79	76	92	.....	68	.....	27	.....	62
Sedgwick	5	1	12	18	20	3	17	28	20	17	8
Seward	98	97	85	91	103	.....	83	.....	.....	43	62
Shawnee	7	16	18	25	3	30	57	7	4	19	13
Sheridan	85	78	83	87	83	61	93	38	....	.....	61
Sherman	86	83	91	53	81	70	86	38	.....	27	62
Smith	49	66	1	38	9	54	7	39	.....	.....	57
Stafford	47	23	11	17	23	45	20	15	11	16	35
Stanton	101	99	93	99	98	.....	100	.....	.....	.....	60
Stevens	102	98	86	103	101	.....	98	.....	.....	.....	....
Sumner	20	10	23	10	16	12	12	22	27	24	44
Thomas	96	87	98	78	86	.....	95	.....	.....	.....	....
Trego	92	90	104	63	97	.....	84	.....	.....	.....	....
Wabaunsee	23	31	55	52	27	18	26	35	26	35	29
Wallace	91	96	92	32	100	.....	88	.....	.....	43	62
Washington	14	7	8	5	22	2	32	27	3	37	16
Wichita	99	93	89	98	93	.....	85	.....	.....	.....	....
Wilson	44	39	57	41	72	16	78	32	29	28	46
Woodson	53	54	68	51	71	19	69	26	24	21	45
Wyandotte	4	5	10	3	1	24	96	13	5	8	2

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FORESTRY STATISTICS, 1913.

COUNTIES.	Street trees.	Wild timber.	Cultivated.				
	Number.	Acres.	Walnut, acres.	Locust, acres.	Cottonwood, acres.	Catalpa, acres.	Other varieties, acres.
THE STATE	751,524	435,629	7,348	13,332	18,157	33,048	48,702
Allen	14,914	3,168	24	11	7	21	172
Anderson	20,025	8,278	25	.....	13	315	258
Atchison	940	5,837	42	26	19	109	145
Barber	2,571	3,690	143	663	105	406	1,258
Barton	7,125	853	59	137	202	34	205
Bourbon	.....	.....	.....	.....	.....	.....	.....
Brown	20,728	6,426	99	4	12	68	881
Butler	3,130	8,287	41	17	1,075	49	333
Chase	1,968	7,390	9	17	11	18	13
Chautauqua	2,429	22,219	19	1,095	1	45	128
Cherokee	10,901	5,602	17	.....	26	382	1,144
Cheyenne	.....	121	35	113	193	2	104
Clark	5,236	191	.....	218	59	37	6
Clay	1,238	4,345	22	20	24	8,030	305
Cloud	629	1,889	175	50	102	115	795
Coffey	3,686	4,967	9	2	17	39	373
Comanche	261	992	11	462	136	180	35
Cowley	25,957	6,635	736	40	169	163	231
Crawford	2,984	355	.....	.....	.....	19	534
Decatur	3,761	1,324	8	366	69	.....	345
Dickinson	13,048	5,276	94	2	55	27	258
Doniphan	4,258	12,054	51	14	19	.....	1,196
Douglas	13,372	9,112	45	3	12	2	258
Edwards	1,811	70	22	2,364	551	541	438
Elk	3,898	7,922	6	1	1	15	1,905
Ellis	1,235	1,025	3	45	37	.....	10
Ellsworth	7,928	3,799	4	125	65	9	174
Finney	37,211	7	5	15	123	.....	20
Ford	1,632	485	8	527	119	383	315
Franklin	7,862	11,265	9	1	.....	5	1,326
Geary	5,132	7,444	48	.....	2	13	202
Gove	2,040	19	5	16	64	1	13
Graham	.....	819	.....	.....	.....	.....	.....
Grant	.....	.....	1	18	91	2	2
Gray	605	.....	8	3	98	1	12
Greeley	550	.....	.....	1	.....	.....	1
Greenwood	7,753	9,380	112	18	5	252	88
Hamilton	96	283	.....	35	44	311	159
Harper	26,934	128	40	596	461	584	746
Harvey	14,436	543	87	23	852	118	889
Haskell	.....	.....	.....	.....	.....	.....	.....
Hodgeman	.....	333	20	87	.....	.....	1
Jackson	7,767	10,150	1	.....	8	5	238
Jefferson	2,176	12,804	9	1	12	22	11
Jewell	2,888	6,596	34	42	60	19	658
Johnson	13,375	5,115	120	7	22	110	308
Kearny	1,011	27	11	20	24	3	16
Kingman	3,318	69	891	332	921	8,106	4,521
Kiowa	18,412	1,406	10	22	171	134	125
Labette	26,540	4,956	44	16	22	68	386
Lane	981	75	20	52	37	1	35
Leavenworth	903	13,248	12	.....	2	8	6
Lincoln	1,722	2,599	17	33	142	.....	432
Linn	4,784	16,853	61	.....	4	21	23
Logan	56	11	.....	170	1	3	20
Lyon	13,759	7,242	203	11	86	72	899

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FORESTRY STATISTICS, 1913—CONCLUDED.

COUNTIES.	Street trees.	Wild timber.	Cultivated.				
	Number.	Acres.	Walnut, acres.	Locust, acres.	Cottonwood, acres.	Catalpa, acres.	Other varieties, acres.
Marion	19,302	2,135	469	290	778	228	1,288
Marshall	6,751	14,544	21	.....	21	64	538
McPherson	5,652	2,484	143	16	667	65	1,261
Meade	1,293	50	28	145	48	16	83
Miami	3,162	10,456	413	4	1	5,128	93
Mitchell	1,621	2,702	11	17	34	14	95
Montgomery	7,102	4,055	10	.....	2	806	519
Morris	2,926	4,118	548	.....	5	204	94
Morton	168	575	.....	30	4	9	.....
Nemaha	12,433	12,716	27	19	54	76	801
Neosho	7,720	7,001	19	27	9	152	677
Ness	778	341	12	51	124	1	156
Norton	.....	15,781	.....	515	9	6	508
Osage	11,836	6,805	145	20	104	171	155
Osborne	11,504	5,113	71	49	88	510	278
Ottawa	3,421	3,200	51	5	189	24	431
Pawnee	33,877	550	42	116	352	92	505
Phillips	10,906	5,995	71	132	610	122	562
Pottawatomie	8,845	15,469	12	2	50	80	366
Pratt	2,304	196	72	113	272	110	283
Rawlins	3,875	620	.....	15	23	.....	107
Reno	10,685	448	114	155	1,939	1,877	2,330
Republic	5,047	5,751	18	24	197	71	2,791
Rice	32,267	1,057	150	31	245	292	1,490
Riley	8,150	5,385	10	1	5	8	.....
Rooks	10,393	1,212	21	63	416	.....	784
Rush	8,124	841	194	891	621	27	224
Russell	2,964	1,517	39	33	90	7	39
Saline	10,747	3,787	52	30	287	23	294
Scott	1,837	.....	59	1,242	881	17	838
Sedgwick	22,101	1,697	98	162	1,218	641	1,027
Seward	.....	14	12	9	1	2	25
Shawnee	47,311	6,165	45	14	1	27	96
Sheridan	1,775	229	12	6	53	1	59
Sherman	3,341	28	.....	16	.....	1	15
Smith	10,791	5,189	21	93	64	8	745
Stafford	1,530	88	133	341	918	448	1,151
Stanton	100	.....	.....	7	5	.....	2
Stevens	.....	.....	26	84	15	12	78
Sumner	15,044	1,638	135	299	340	199	1,141
Thomas	1,395	15	.....	27	.....	.....	49
Trego	1,070	11	4	335	927	.....	599
Wabaunsee	6,132	12,457	54	4	12	38	61
Wallace	1,068	1	.....	10	26	5	.....
Washington	4,496	13,220	274	8	100	176	422
Wichita	1,189	.....	1	14	2	2	.....
Wilson	1,734	6,799	145	5	.....	21	226
Woodson	6,321	7,835	20	6	9	512	2,465
Wyandotte	10	2,284	71	15	.....	2	.....

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